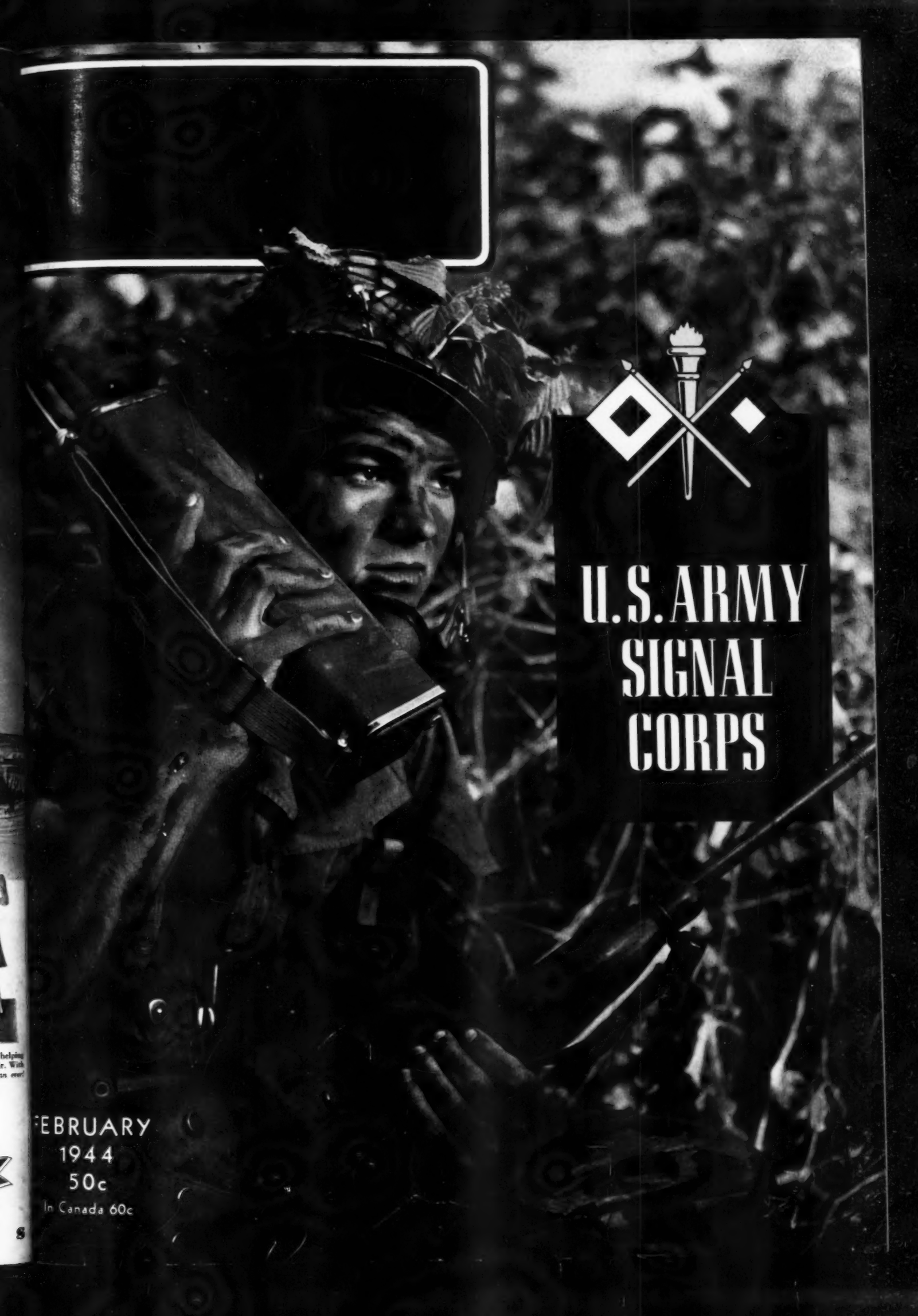


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TRAINING MEN FOR VITAL RADIO JOBS

These Men Have SPARE TIME BUSINESSES



"I repaired some Radio sets when I was on my tenth lesson. I really don't see how you can give so much for such a small amount of money. I made $600 in a year and a half, and I have made an average of $10 a week—just spare time."—JOHN JERRY, 1337 Kalamath St., Denver, Colo rado.



"I am engaged in spare time Radio work. I average from $5 to $10 a week. I often wished that I had enrolled sooner because all this extra money sure does come in handy."—THEODORE K. DuBREE, Horsham, Pa.



"I am doing spare time Radio work, and I am averaging around $500 a year. These extra dollars mean so much—the difference between just barely getting by and living comfortably."—JOHN WASHKO, 97 New Cranberry, Hazleton, Penna.

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"For several years I have been in business for myself making around $200 a month. Business has steadily increased. I have N.R.I. to thank for my start in this field."—ARLIE J. FROEHNER, 300 W. Texas Ave., Goose Creek, Texas.



"My Loudspeaker System pays me about $35 a week besides my Radio work. If it had not been for your Course, I would still be making common wages."—MILTON I. LEIBY, JR., Topton, Pa.



"I started Radio in the Marines in 1917. Later I started studying Radio with N.R.I. I recommend N.R.I. Training to any man no matter how long he has worked in Radio. I now have my own business."—CHARLES F. HELMUTH, 16 Hobart Ave., Oaseeon, N. J.

The men above are just a few of many I have trained at home in spare time to be Radio Technicians. Today they are operating their own successful spare time or full time Radio businesses. Hundreds more of my men are holding good jobs in practically every branch of Radio, as Radio Technicians or Operators. Aren't these men PROOF that my "50-50 Method" of training gives you, in your spare time at home, BOTH a thorough knowledge of Radio principles and the PRACTICAL experience you need to help you make more money in the fast-growing Radio industry?

More Radio Technicians Now Make $50 a Week Than Ever Before

There's a big shortage today of capable Radio Technicians and Operators. Fixing Radios pays better now than ever before. With new Radios out of production, fixing old sets, which were formerly traded in, adds greatly to the normal number of servicing jobs. Broadcasting Stations, Aviation and Police Radio, and other Radio branches are scrambling for Operators and Technicians. Radio Manufacturers, now working on Government orders for Radio equipment, employ trained men. The Government, too, needs hundreds of competent civilian and enlisted Radio men and women. You may never see a time again when it will be so easy to get started in this fascinating field.

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RADIO NEWS

"Reg. U. S. Pat. Off."

FEBRUARY, 1944 Vol. 31. No. 2

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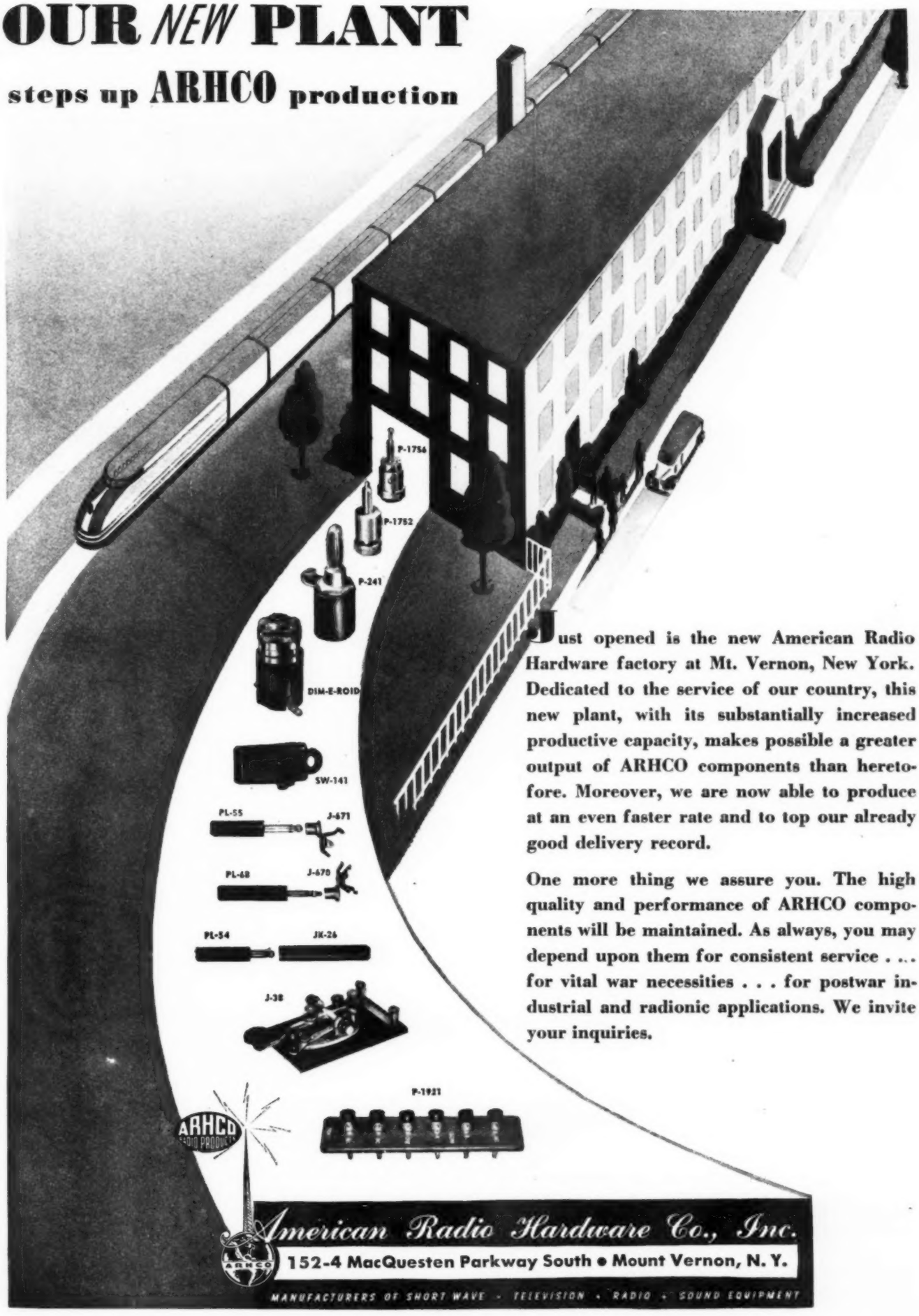


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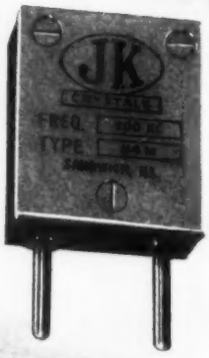
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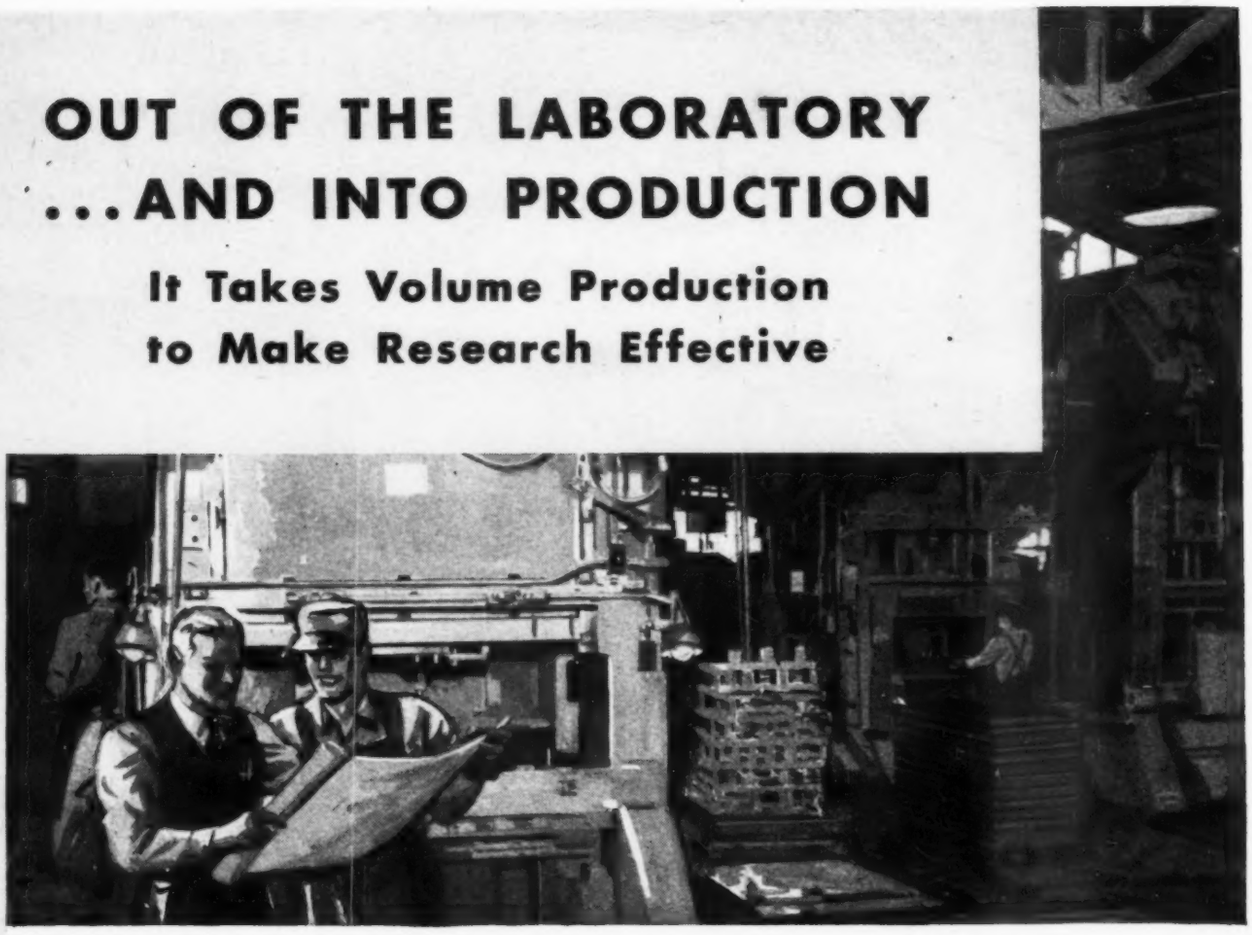
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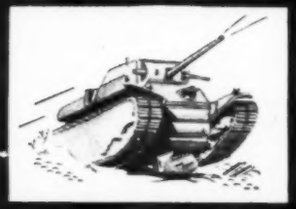
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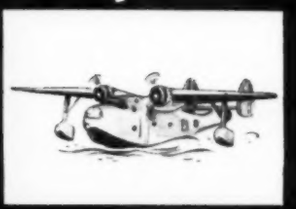
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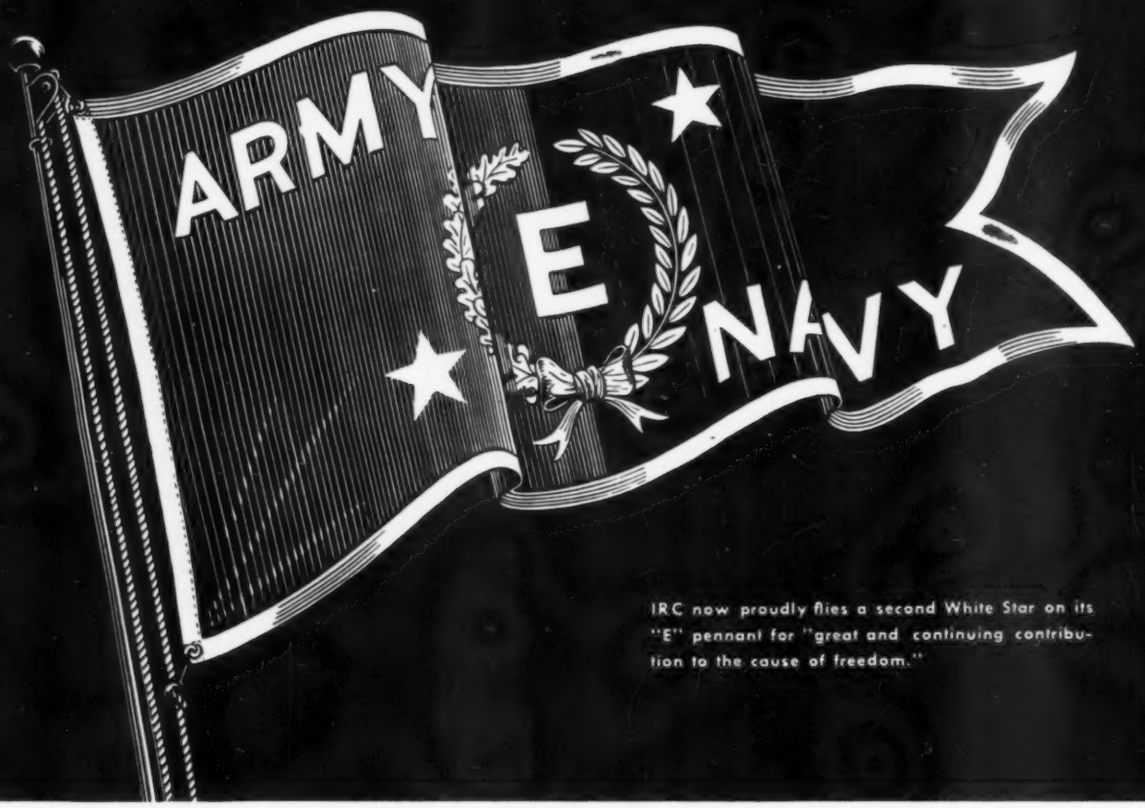
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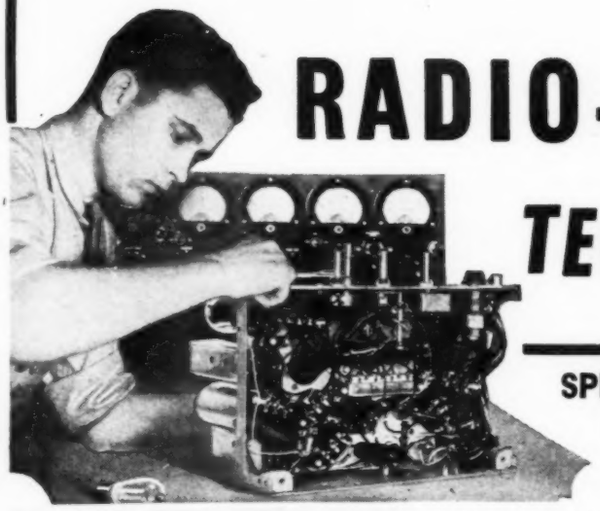
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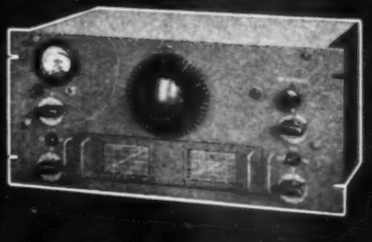


MEDIUM TANK, M-4
PHOTO BY
US ARMY SIGNAL CORPS

BUTTONED DOWN *and ROLLING*

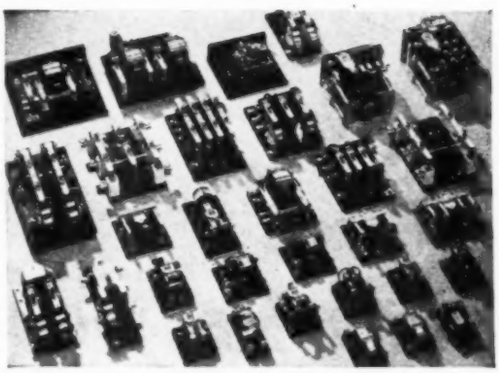
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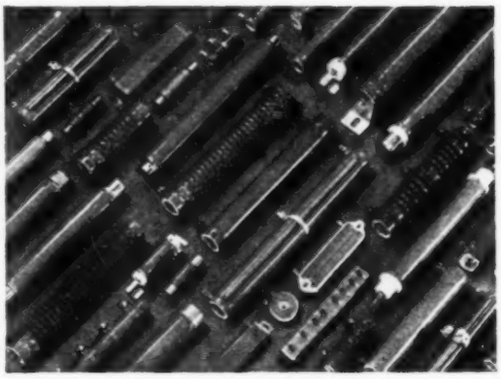
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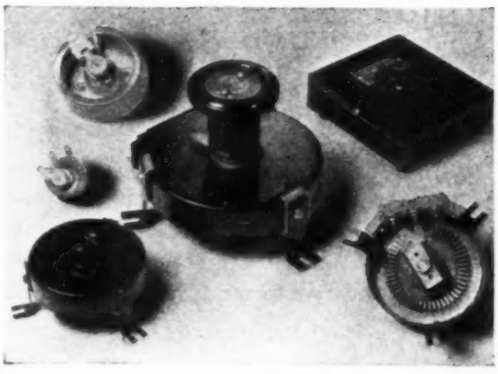
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The manufacturers of ***Micamold Capacitors*** grasp this occasion to send greetings to the Men of the United States Signal Corps. We gratefully acknowledge the brilliant performance of these gallant specialists . . . and take deep pride in knowing that our capacitors accompany them in battle on all fronts.

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Standardize on Mallory volume controls, capacitors, vibrators, switches and resistors for all replacement service. You'll save a lot of precious man hours. And your customers will recognize and appreciate the kind of work you do.

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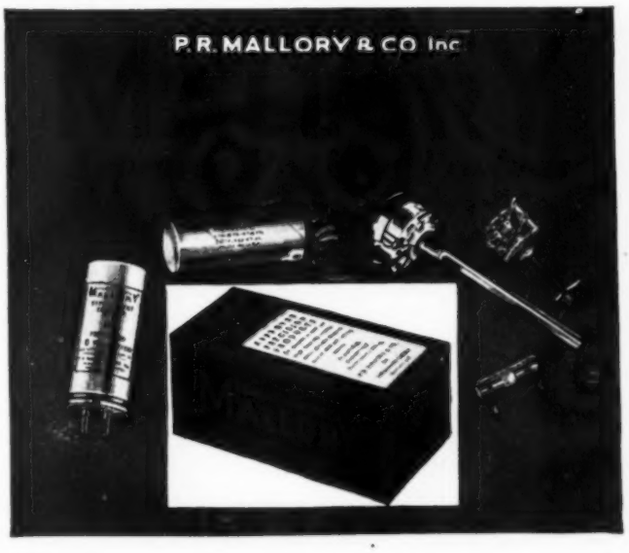
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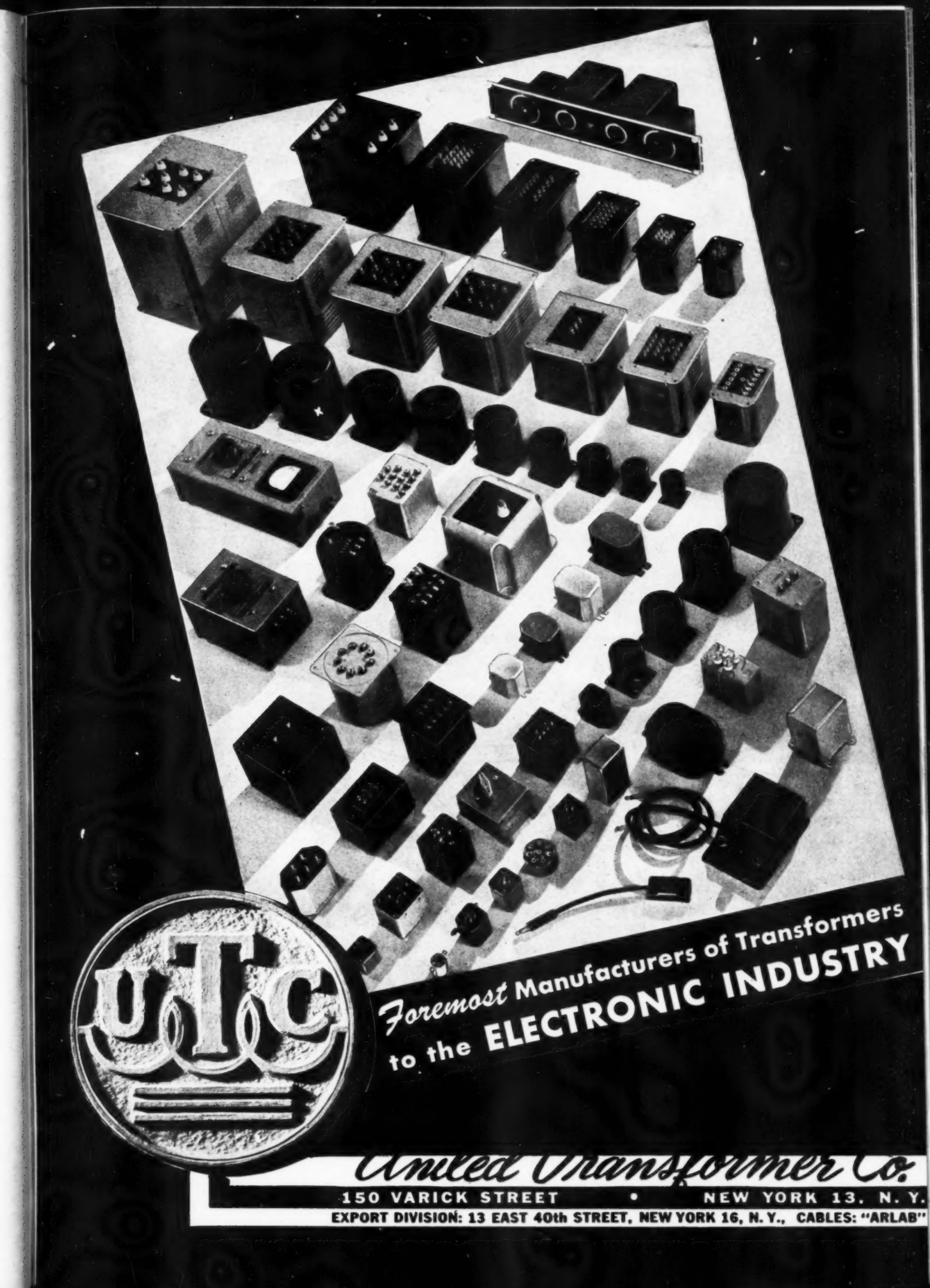
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In every art or craft, the work of a few masters will always be of a quality above all else of its kind . . . The name Wedgewood denotes rare excellence in pottery. The name Gobelins characterizes tapestries of incomparable beauty. So, too, in its field, the name UNITED stands for electronic tubes which are individual masterpieces . . . While electronic tubes are the very heart of countless machine-age devices, their manufacture is as dependent upon expert minds and skilled hands as is the fashioning of a fine vase or violin . . . UNITED Tubes are engineered to the most exacting specifications. They are constructed of the highest quality materials obtainable. Yet no tube can be one bit better than the skill that assembles its intricate component parts. Herein lies one reason why UNITED Tubes are in a class by themselves for efficiency and long life.

Helping Supply the Vital Needs of

THE MAN BEHIND THE "MIKE"



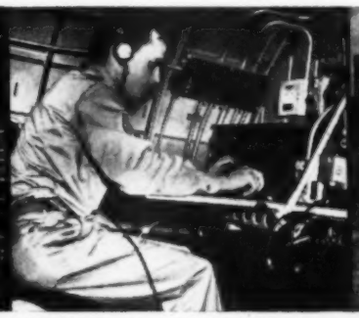
Kellogg microphones and other communication equipment are used in radio-equipped "half-tracks." (U. S. Army Signal Corps Photo.)



Radio operator at control panel of large Navy amphibian. (U. S. Navy Photo).



Kellogg switchboard at large Army Air Force Navigation School. (U. S. Army Air Forces Photo).



Operator at control panel of aircraft 2-way high power liaison set. (U. S. Army Air Forces Photo.)



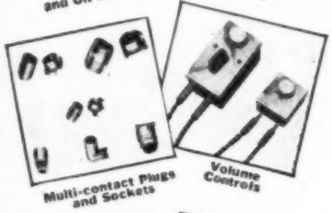
Kellogg-made microphones, headsets, etc. are widely used with field telephone and wireless sets. (U. S. Army Air Forces Photo).

A Few Examples of Kellogg Products in Military Use



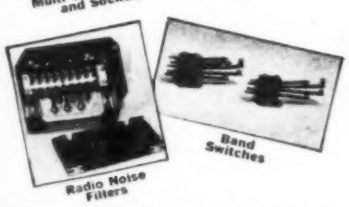
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Behind the man behind the "mike" stretches a vast, complex network of radio and telephone equipment. To help supply the tremendous quantities of communication equipment needed in modern warfare, the Kellogg plant is busy day and night, turning out a wide variety of products ranging from tiny capacitors to complete telephone switchboards. For here at Kellogg are the required skills for such production. Here is the experience and background, gained in supplying the telephone and many other industrial fields with fine communication equipment for 47 years. Here are the facilities for precision mass production to rigid specifications. Here is a modern research, engineering and manufacturing organization qualified to work with you on any problem involving communication equipment. Kellogg Switchboard and Supply Company, 6676 So. Cicero Ave., Chicago 38, Ill.

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● Kellogg has the capacity, resources and manpower to handle more contract and subcontract orders for communication and industrial electrical equipment for the Armed Forces. So whatever your requirements in this respect, write immediately to the Kellogg Industrial Sales Department.

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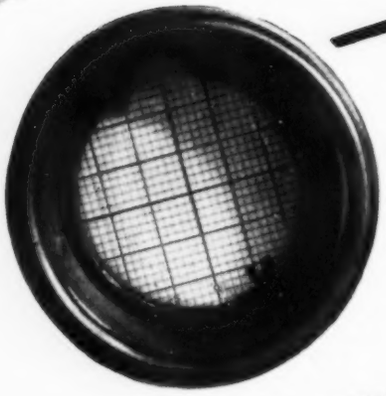
WHERE ENGINEERING AND RESEARCH BUILD

Finer Communication Equipment FOR WAR AND PEACE

It's the Little Things That Count

OR, WHAT MAKES THE 155-C DIFFERENT FROM OTHER 3" OSCILLOSCOPES?

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"built-in light shield"—The front of the tube is recessed; you can see transients even in bright light.

2



"binding jacks"—Can be used with removable binding posts or with locking pin plugs. A new convenience feature.

3



"removable graph screen" to permit special observations—Place or replace it with a twist of the wrist.

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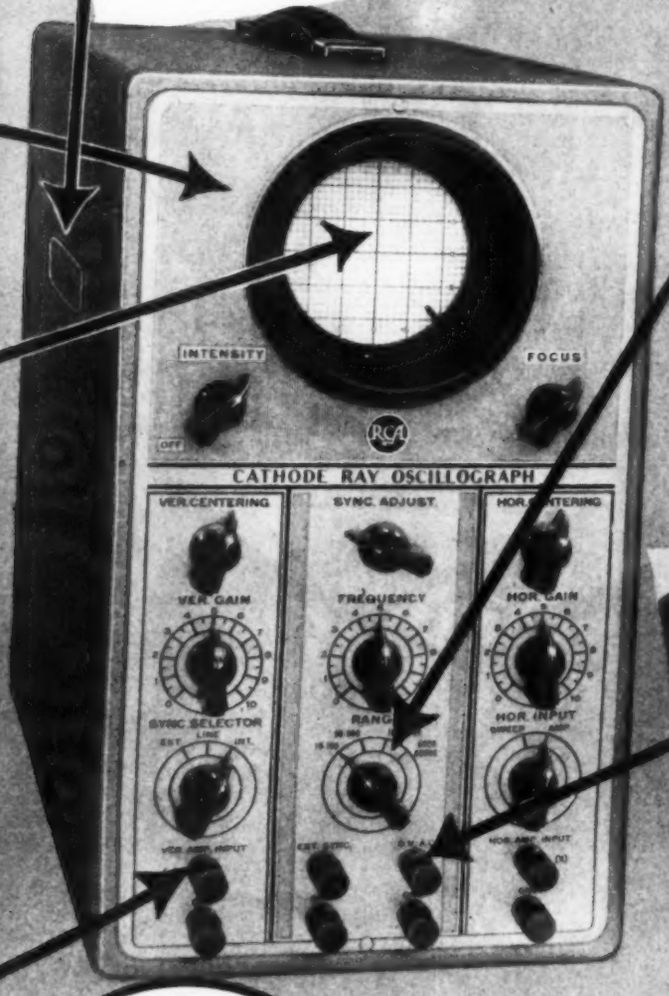


"direct deflector connections"—For observations at radio frequencies when such are desirable.

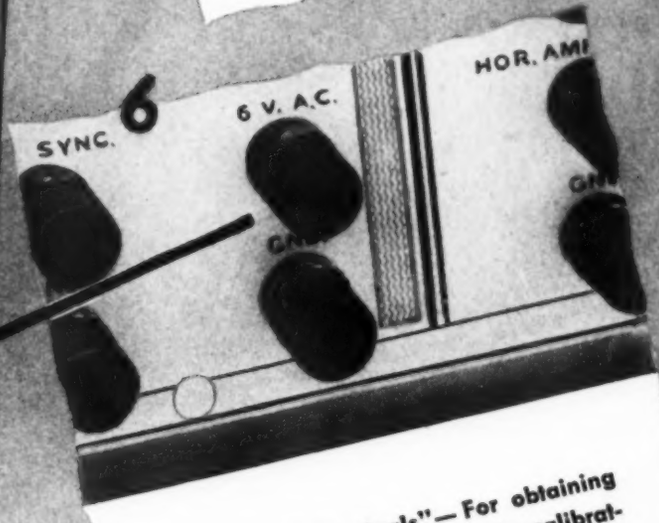
5



"improved timing axis oscillator"—range extended to 60 kilocycles—more linear sweep.



6



"6-volt AC terminals"—For obtaining a handy sine wave ordinate for calibrating purposes.

Please address inquiries to Test and Measuring Equipment Section, Radio Corporation of America, Camden, N. J.

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THIS IS *Today's Radio!*

Communications are the lifeblood of today's war tempo . . . whether they're signaling "bombs away!" over the intercom system of a bomber five miles above a vital target . . . or aiding a sleek submarine as it stalks its unsuspecting prey through the silence of the deep. That is radio today. When peace comes, with it will come greater FADA skills developed by wartime lessons . . . devoted to the production of FADA radios with hitherto undreamed-of tonal faithfulness, performance and durability.



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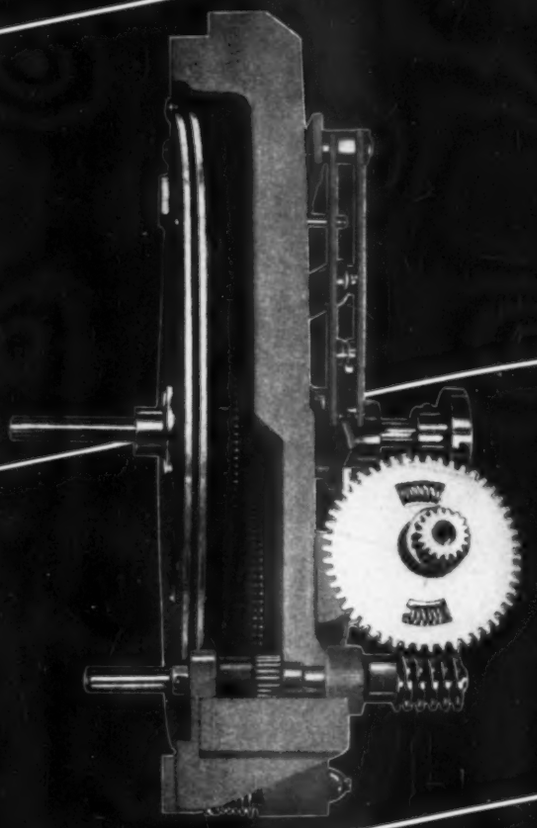
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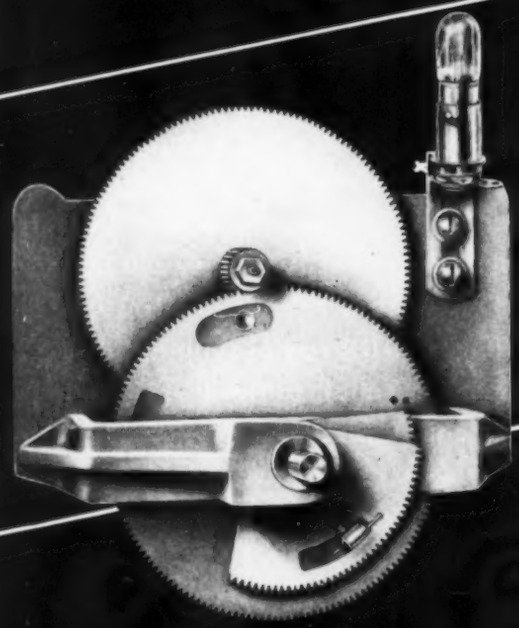
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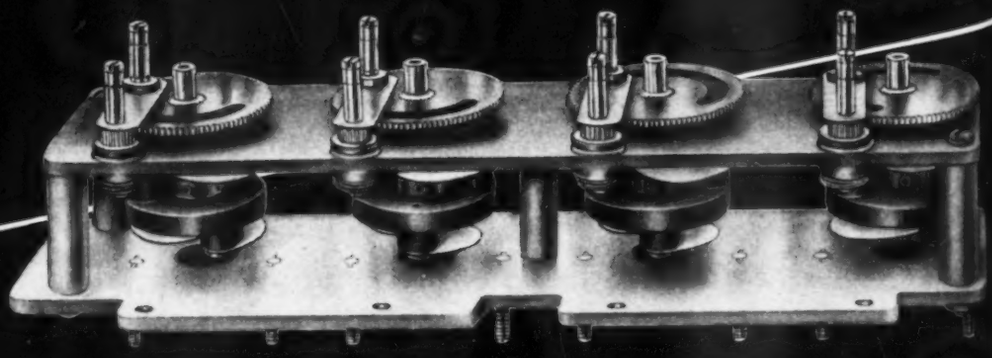
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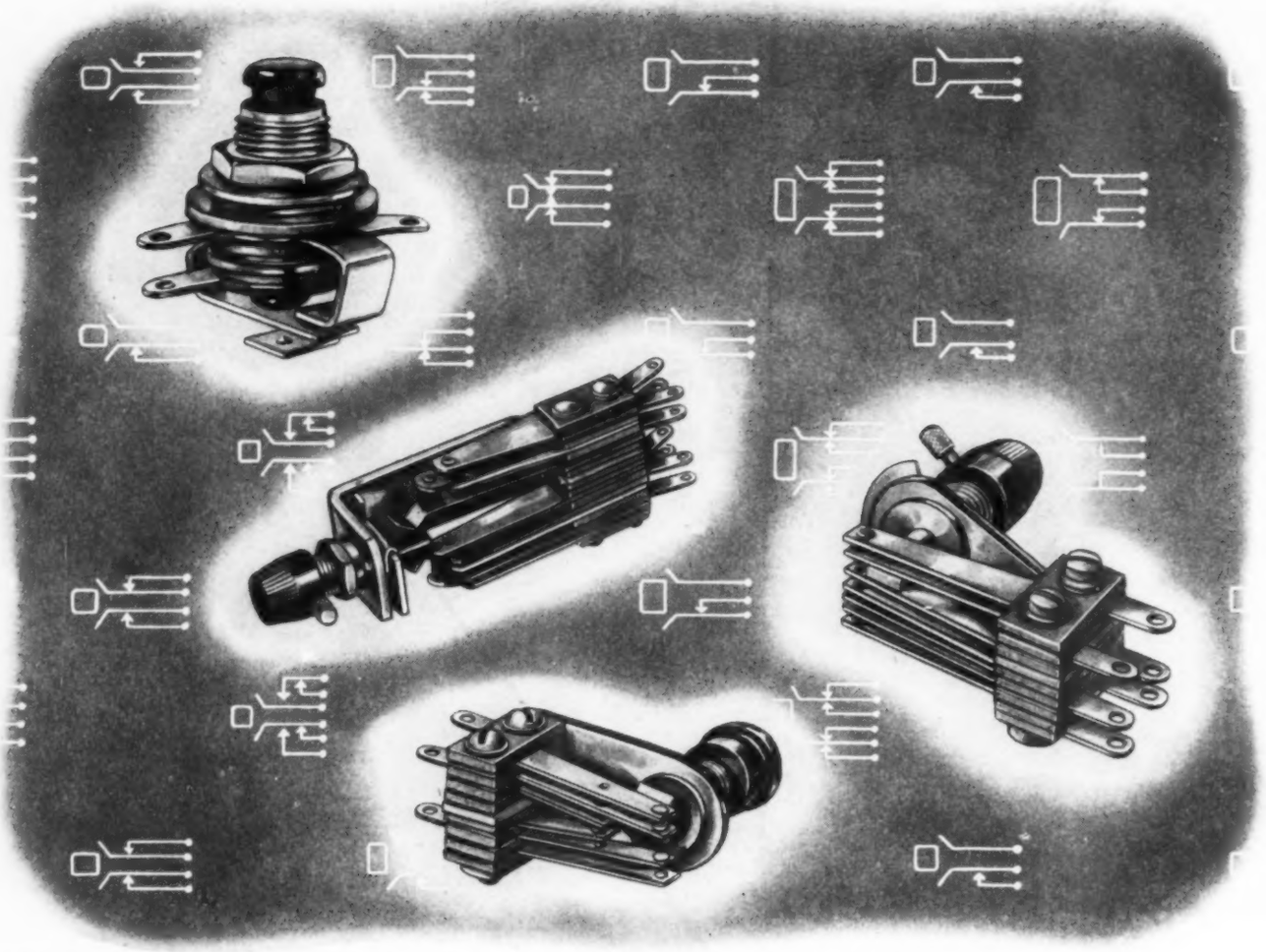


"GET THE MESSAGE THROUGH"

The nation's largest producer of electronic and communications equipment for war is . . .

Western Electric





FOR TOP EFFICIENCY AT THE KEY-POINT IN A CIRCUIT

UTAH SWITCHES EVERY TIME!

Where the human element and mechanical perfection must combine to provide top performance, insist on Utah Switches. They are time-tested in hundreds of electrical applications in industrial plants and on far-flung battle-fronts.

There's a Utah Switch for virtually every circuit

UTAH Switches are made to fit your electrical and space requirements. Compact size, highest quality material and precision manufacture make Utah Switches everything a switch should be. Utah "Imp" push-button switches have the finest nickel silver or phosphorus bronze springs with integral contacts. Springs are fully insulated from the mounting bushing. High-grade phenolic insulation is used. They are available in three circuit arrangements: "single make," "single break," one "break make."

Also available are Utah Rotary and push-button jack switches, in long and short types. Small and compact in size, they are made to take minimum panel space. Full insulation is provided for all electrical parts.

Take advantage of Utah's extensive electrical and electronic experience. Write today for full information on Utah switches.

UTAH RADIO PRODUCTS COMPANY, 824 Orleans St., Chicago, Ill. Canadian Office: 560 King St. West, Toronto. In Argentine: UCOA Radio Products Co., S. R. L., Buenos Aires. Cable Address: UTARADIO, Chicago.

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PUZZLE . . .
Where is the Airport?

The pilot knows—because, far below these clouds, the ever dependable radio range constantly sends out safety signals . . . signals which guide him down through the mist, past jagged mountain peaks, on to the haven of the airport.

Radio Receptor, since the very beginning of the U. S. system has worked with governmental authorities in the development of radio ranges and other radio navigational aids.

In peace, we equipped many leading airports and airways. Today, we are making radio ranges and airdrome traffic controls as our special contribution to the war effort.

When peace comes again, *Radio Receptor*, with its rich background of experience in the design, manufacture and installation of radio navigational aids and airport traffic control equipment, will broaden its activities in keeping with the tremendous growth of postwar aviation.

Send for a copy of our non-technical booklet, "Highways of the Air" — DESK RN-2

A postwar airport development program to cost approximately $800,000,000 is recommended by William A. M. Burden, special aviation assistant to the Secretary of Commerce. The airport survey, made by the CAA in 1939 and which recommended some 4000 airports, will now be increased to approximately 6000, most of the increase being in small fields. "One thing is certain," Burden said, "And that is, if the program is to be developed on a sound basis, there must be a far higher proportion of local financial participation than there has been in the past."

Awarded for Meritorious Service on the Production Front

Radio Receptor Co.
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251 WEST 19th STREET NEW YORK 11, N. Y.

★ SINCE 1922 IN RADIO AND ELECTRONICS ★

WHEN THE CONE OF *Silence is Golden!*



Too great commendation cannot be given to the radio range system inaugurated by the Civil Aeronautics Administration. Not so many years ago, "taking the mail through" in adverse weather called for a pilot of above-par experience. Now, by this vast, wondrous system of airways, timetables for the arrival and departure of great airliners are commonplace.

In inclement weather, the Cone of Silence plays no small part. A plane, riding the beam into port, is warned of arrival over the beacon by a sudden complete silence . . . a silence that is "golden" to an element-harried pilot.

The part played now by Electronic Enterprises, in both civil and military aviation progress can be applied to your post-war projects. E-E engineers are available for collaboration on your problems; inquiries are invited.

ELECTRONIC ENTERPRISES, INC.

ELECTRONIC e ENTERPRISES

GENERAL OFFICES: 65-67 SEVENTH AVENUE, NEWARK, NEW JERSEY

"The difficult we do immediately, the impossible takes a little longer." —*Army Service Forces*



Electro-Voice DIFFERENTIAL MICROPHONES

Developed by our Engineering Department in close collaboration with the Fort Monmouth Signal Laboratories, and hailed as an accomplishment in the science of speech transmission, the *Differential Microphone* effectively shuts out all ambient noises and reverberation . . . permitting voice to come through clearly and distinctly . . . while rejecting the terrific din in tanks and the roar of gunfire.

In its present form, the *Differential Microphone* is produced as the T-45, a "Lip Mike," for use in battle by our Armed Forces and those of our Allies. Postwar developments will provide a variety of models with advantages that will be felt in many phases of civilian life.

- Frequency response substantially flat from 200-4000 cps.
- Low harmonic distortion
- Cancellation of ambient noise, but normal response to user's voice
- Self-supporting, to free both hands of the operator
- Usable when gas mask, dust respirator or oxygen mask is required
- Uniform response in all positions
- Unaffected by temperature cycles from —40° F. to +185° F.
- Ability to withstand complete immersion in water
- Physical strength to withstand 10,000 drops
- Weight, including harness, cord and plug, less than 2 ounces



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PHILCO SALUTES THE SIGNAL CORPS

—the "Eyes and Ears of the Army!"

BACK in the time when Horatius made headlines by holding a bridge against a "vastly superior force", communications weren't much of a military problem.

In fact, a leather-lunged sergeant (or the Roman equivalent thereof), plus a few runners who were moderately fast on their feet, constituted an efficient and effective Signal Corps.



But it's a different story today.

As modern warfare calls for mass deployment of mechanized might, with split second timing and close coordination of land, sea and air power—establishing and maintaining effective communications is now a herculean undertaking!

Moreover, today the success or failure of military operations depends on getting the *right* message to the *right* place at the *right* time. With a slip anywhere along the line, control is lost, command is balked and in general, the fat is in the fire.

The U. S. Army Signal Corps has accepted this tremendous responsibility—and is discharging it with such efficiency and competence that a truly staggering job *looks* deceivingly easy!

Before the war, Philco was the leader in the field of radio for 12 straight years. Today Philco laboratories and Philco assembly lines are devoted 100% to research and production for our armed forces.

We're rather proud that a major portion of the materiel produced by Philco is for the Signal Corps. As suppliers, the men and women of Philco take considerable satisfaction, however secondhand, in the achievements of this great branch of the armed services. Theirs is a job well done!

PHILCO
CORPORATION



Courtesy U. S. Signal Corps.

A RADIO STAR AT $78 PER MONTH

TWO YEARS AGO he was just one of the kids in one of the homes on one of the Main Streets in one of the towns around here. A radio in his room? You bet! Couldn't get along without one. It brought him new hit tunes. Gags. Mystery stories. News.

He never dreamed, as he listened, that he'd be "on the air" with his own show . . . and the damn most important show in the world, too.

He's broadcasting now, all right. News. Big news. Movements. Actions. Progress. Supply needs. News that makes the difference between a nest of Japs wiped out or a bunch of our kids helplessly trapped.

When the history of this fight is written, there will be laurels aplenty. But count on a solid share for the Signal Corps. For the wildest imaginations of Jules Verne . . . or even the fantasies of Superman . . . are dwarfed by the exploits of our armies' "eyes," and "ears," and "heartbeat."

We are mighty proud that Pilot Radio was one of the first to apply its facilities, experience and abilities to the communication needs of the United Nations. It's thrilling, exciting, and a rare privilege to be a part of this vital link in our Victory chain.

PILOT RADIO

PILOT RADIO CORP. • LONG ISLAND CITY, N. Y.



to lift another mist from the mind of man

War's necessity mothers tomorrow's blessing. War-born electronic devices which now strengthen and sharpen a war pilot's radio signal may, some happier tomorrow, guard the glory of a symphony.

Who knows the future of these discoveries which keep our pilots in clear communication, even through the deafening crackle of a tropical storm? Who knows what undreamed comforts, undreamed glories flicker in the electronic tubes? Or in any of the modern miracles so familiar to us at Sylvania?

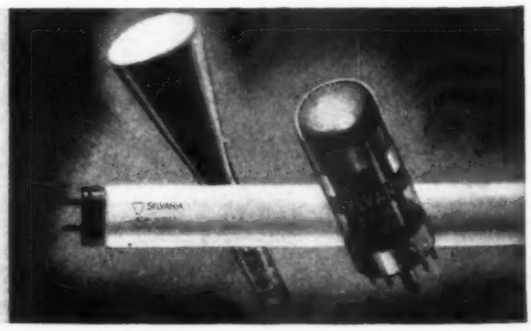
New sound for the ears of the world. New knowledge for the eyes of the world. More mists of ignorance swept away! Those are the potentials which inspire us, in everything we do, to work to one standard and that the highest known.

SYLVANIA ELECTRIC PRODUCTS INC.

EXECUTIVE OFFICES: 500 FIFTH AVENUE, NEW YORK 18, N. Y.

RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES, INCANDESCENT LAMPS, FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES

IN ACTION ON THE HOME FRONT . . . Sylvania Fluorescent Lamps and Equipment are helping our war factories speed production. Sylvania Radio Tubes are helping bring information and entertainment to homes throughout the land. Sylvania Incandescent Lamps are serving long and economically in these same homes. As always, the Sylvania trade-mark means extra performance, extra worth.





THE GIANT OF MILITARY RADIO...

THE ARMY'S SCR-299 COMMUNICATIONS UNIT

A GIANT in performance – a giant in reliability – a giant in adaptability – a giant in winning ultimate victory is the Signal Corps' mobile radio communications unit – the *Hallicrafters* SCR-299.

Military observers, prior to our entry into the war, were unanimous in their opinion that the success of modern fast-moving "blitz" tactics were in direct proportion to the efficiency of the communications system of the armies. New tactics required new weapons to fight them and new battle fronts required new equipment to meet various conditions encountered. The factors that could be foreseen in former theatres of war were tabulated and requirements for communications equipment that would operate adequately under current conditions were used as basic specification requirements for the building of the radio set SCR-299. This radio set is the unit the *Hallicrafters Company* delivered to the Signal Corps to be used by all branches of the service and by many of the United Nations.

Military Requirements

Up to 1940, communications by such methods as the telephone, signal devices and messengers had been adequate to meet the needs of the slower-moving military machine. Germany's initial successes in a highly mechanized form of warfare were attributed to the fact that they had worked out an efficient and highly

reliable communications system whereby the lightning-like movements of their panzer divisions could be coordinated and timed for split-second action.

Such tactics produce an ever-changing battle line ranging over distances of many hundreds of miles as compared to the slower outmoded warfare which moved but few miles in one operation. Unless reliable, direct communications between these widely separated divisions in the field and their commanding officers could be provided, the effectiveness and efficiency of the total army would be lost.

Our technicians and particularly the communications officers could see that in the event this country should become involved in the conflict then raging throughout Europe and Asia, our armies would likewise have to be equipped with a modern means of communications to coordinate our combined ground, air, sea and armored forces for none could function efficiently without the aid of the others.

To meet the demands of those forces, a radio transmitter was required of high power, capable of communicating by voice infallibly over a distance of at least 100 miles, self-powered, sturdy enough to insure operation under all conditions, flexible enough to cover a wide range of frequencies and able to operate while in motion or at fixed locations. It had to be entirely independent in its mobility–containing repair and replacement parts to insure its continued operation while on detached missions. It had to be so designed and constructed for operation in the cold of the North, heat of the South, humidity of jungles, and in the dry heat of the deserts where sand makes operation of delicate mechanisms problematical.

The problem was to procure such a unit, test it under all conditions and produce it *in time* to give our armies the essential means of communication that anticipated needs dictated.

The HT-4 Selected

Accordingly, there was set up at the *Fort Monmouth General Development Laboratories* under Major General Roger B. Colton, now Chief of Engineering and Technical Services in the Signal Corps, a program which called for the accumulation of commercially-built transmitters having the necessary qualifications for adaptation to Signal Corps requirements. Some 20 odd sets were sent to Fort Monmouth by manufacturers throughout the country. Each was given a complete technical analysis and those found suitable were put through various exacting performance tests. After considerable experimentation, the *Hallicrafters* standard HT-4 transmitter was selected as the "basis" for the desired radio unit.

The HT-4 transmitter was first designed exclusively for amateur use and had been built commercially for several years. It was compact and stable. It was capable of delivering 325 watts of power on voice and 450 watts on c.w. (code). It was crystal-controlled but provided optional use of m.o.p.a. and was able to work over a wide range of frequencies which was one of the most sought-after qualifications of the Signal Corps.

Adaptation

The changes requested by the Signal Corps were achieved by the concerted efforts of Hallicrafters engineers working side by side with the technicians of the Corps. In order to adapt the HT-4 for military use, it was simply necessary to incorporate minor changes and to augment the basic unit with additional "gadgets" which would permit the transmitter to handle a wider range of frequencies and to standardize upon the control equipment.

The steel cabinets were strengthened and the individual units were shock-proofed so that they could withstand the terrific pounding that they would encounter when placed in standard military vehicular units. All cables, connectors and plugs were designed specially to permit the extreme flexibility of operation in motion. In addition, some component parts had to be treated specially to prevent corrosion which would be encountered in various climates where equipment would be transported.

Other minor changes were made including the addition of several relays in order to permit automatic changeover of circuits required for military operations. The engineers designed an overload relay system that proved to be completely chatter-proof. An ordinary relay would "kick out" when travelling in a unit over rough terrain. Reset controls were placed on the front panel and made readily accessible to the operators. It was fortunate that the original HT-4 transmitter was designed around two basic units: the RF deck, containing the complete radio frequency exciter, power amplifier and special switching circuits and the other which included power supply and modulator as well as power control equipment. A master oscillator was designed which provided continuous coverage without the necessity of providing a maze of crystals ground to the many frequencies which would be required for military communications. A switch located on the tuning unit controls the changeover from crystal to master oscillator.

The antenna problem was met after much experimentation by designing a vertical "whip" which was approximately 35 feet long. In order to match the antenna to the wide frequency ranges of the transmitter, a special antenna coupler had to be designed which would permit accurate loading at any fre-





quency covered by the transmitter. Commercial engineers devised a continuously variable network which, when connected to the vertical, provided the necessary matching required. The SCR-299 uses separate vertical antennae, one for each receiver, and these are approximately 10 feet long. A total of three antennae are to be seen on all units bearing the 299 designation.

A maze of replacement parts are required for the maintenance of vital communications equipment. Those included with every SCR-299 include a representative group of condensers, tubes, resistors, meters and service tools as well as complete storing facilities located under the operating bench. All replacement items are packed uniformly and are standardized for easy location.

After the mechanical considerations were met and a layout adopted for the various units, attention was given to the design of a suitable truck which would provide the necessary accommodations. It was established that one of approximately 1½ ton capacity would be required. A dual system for operation was provided for the two operators on duty at all times. Either of the two operators have complete control of all receiving and transmitting equipment.

In addition, another unit was required to transport the gasoline-driven motor generator that would be required to furnish power for the operation of the transmitter, receivers and lighting within the communications truck.

It was necessary to separate the two units in order that mechanical vibration as well as noise from the gasoline plant could be removed where it would not interfere with the transmission and reception of important communications.

An interesting sidelight on the construction of the truck was the incorporation of electrically operated heating and ventilating apparatus. Complete lighting facilities were provided and power for the operation is obtained from the gasoline plant along with the radio equipment.

Field telephones with a goodly supply of cable are carried in each unit. They are used either as interphones or may be used to control and modulate the transmitter from a remote point.

Official Nomenclature

The new version of the HT-4 transmitter became known as the Signal Corps' (BC-610) transmitter. Receivers finally supplied were the standard Signal Corps (BC-312), (342). The speech amplifier known as the (BC-614), tuning unit (BC-729) and frequency meter (SCR-211) together with the power unit (PE-95) complete the list of main items. All these finally became part of the truck and trailer unit which was given the official (SCR-299) but later became better known as the "mobile communications unit."

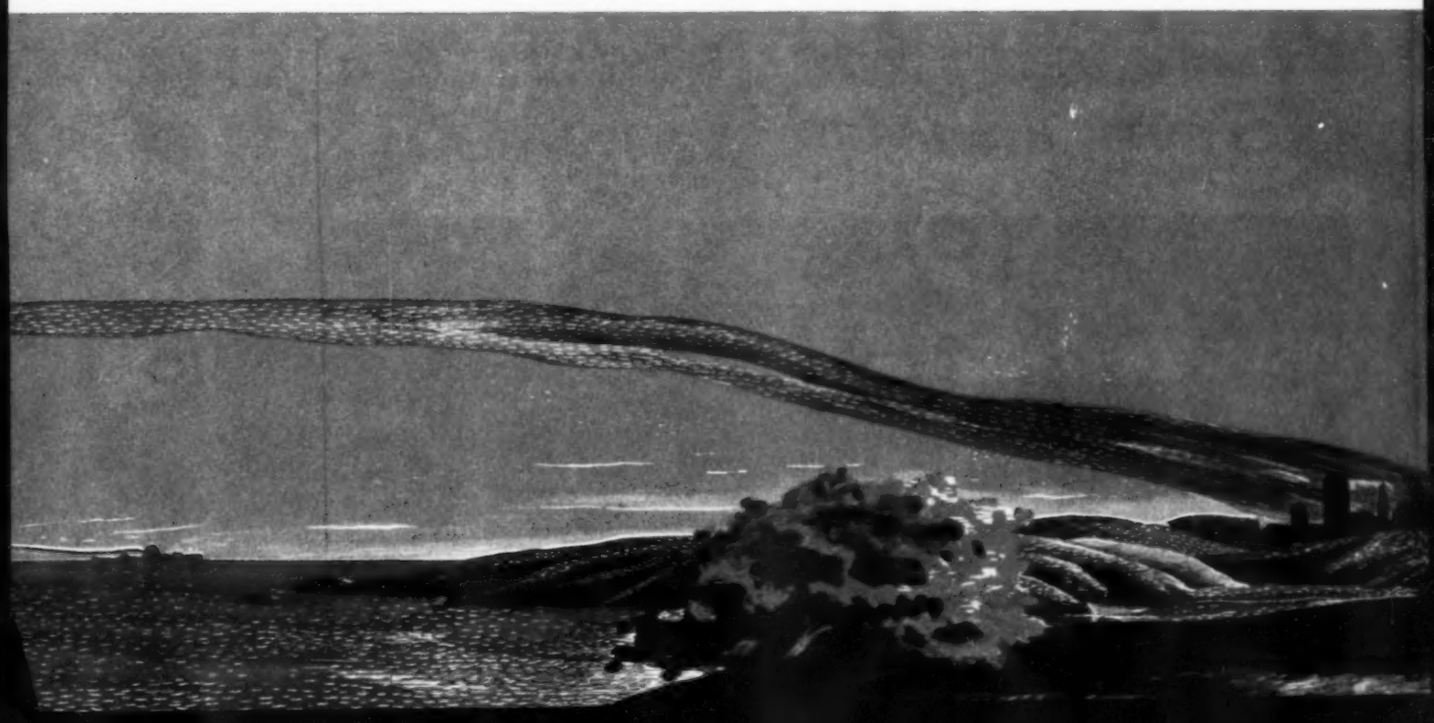
After assembly and pre-test at the Hallicrafters plant, the units were delivered to the Signal Corps for final test and acceptance. During these tests, this new mobile radio station was put through its paces. It received the most abusive kind of road test; was operated under the most adverse conditions that could be devised by the testing engineer. Arctic, tropic and desert conditions were simulated and the unit checked for all types of breakdowns and deficiencies. Final acceptance by the army of the SCR-299 is adequate proof of a job well done.

The production of such a versatile adjunct to the communications service can only be attributed to the close cooperation and collaboration of far-sighted Signal Corps officers and civilian engineers. To these technicians goes the full credit for a unit that, since its adoption, has served in more far removed places of the world than any other type of radio equipment.

Among this vast group of Americans working toward ultimate victory we find many pre-war amateurs who were responsible for the original design of the HT-4 transmitter and who, through their applied knowledge, gave to our armed forces this giant weapon in the battle of communications!

hallicr

WORLD'S LARGEST EXCLU
SHORT WAVE RADIO COMM



Combat Duty

The SCR-299 was among the first equipment to land on the shores of Africa and did yeoman duty during those hectic days when the fate of the United Nations' African campaign was in the balance. It was the only means of communication for long periods of time linking Oran and England, Oran and Casablanca, Gibraltar, Algiers and Accra.

By this time our Allies had heard of this famous set that gave such phenomenal results and through "Lend-Lease" had obtained many complete units. British Generals Montgomery and Alexander used it to coordinate their successful efforts against the Germans in North Africa. General Ingles, in commenting on this fine piece of military strategy by our British Allies, said "that set (SCR-299) scurrying across sands of the deserts and over tortuous trails of mountains helped bring Rommel to his knees in North Africa..."

General Eisenhower gave due credit to the SCR-299 for the successful reorganization of the American forces and final defeat of the Nazis at Kasserine Pass.

In the invasion of Sicily and later Italy, the 299 was used with telling results. It was, as General Ingles said, "a help in keeping casualties of American forces surprisingly low."

In its travels far and wide the 299 has received grateful praise from both our own and our allied high ranking officers. Colonel Williams, Chief of Staff of the First Armored Division, said "the SCR-299 is a fine set . . . this set gives us the range we need and more."

"Down under" where the humidity is high and sun is hot the 299's are also proving their mettle. Lieutenant Colonel Edwin Stoll, Division Signal Officer in the South Pacific, upon returning home recently, reported that these transmitters were serving our forces well and that they were the main means of communication between Australian campaign headquarters and New Guinea.

Such expressions as "the best sets in the Signal Corps"; "breakdowns are infrequent"; "everybody likes them"; "a very good set"; "nothing but the highest praise for them"; "the 299 is a tremendous thing out here. It is unbeatable and very popular"; "it is just like any good ham rig – easy to operate" are common from both the officers and enlisted men on actual duty throughout the entire world.

Diversified Uses

Though the original Signal Corps requirements were for communications points up to 100 miles, these transmitters have under favorable conditions made and maintained contact over 2300 miles of land and sea.

In the original design of the complete unit the foremost thought was mobility and to this end certain other desirable features had to be sacrificed. The fact remains, however, that these units even in their highly mobile state can be and are being used as fixed stations. The short whip antenna used for road and field work is disconnected easily and the long-wire flat-top antenna substituted, for "fixed position" operation. The power supply is easily detached and moved to more sheltered spots. It is also possible to operate the unit by remote control, making it feasible for the operator to be indoors and yet get full use of the equipment.

It has truthfully been said that the victorious army is the army that "gets there fustest with the mostest." In order to accomplish such a feat, communications is one of the deciding factors for it is only by the proper coordination of all units involved that the "most" can get there before the enemy. It has been proved many times over in the present conflict that the terrific striking power of these units must work with split-second timing. Without adequate communications the numerous divisions of such an army are not and cannot be used to their full advantage. Our armies had to overcome Germany's panzer units, with their high-speed communications networks, and the SCR-299 provided the answer to this heretofore difficult problem.

BUY MORE BONDS!

afters

SIVE MANUFACTURER OF
IUNICATIONS EQUIPMENT




Jensen
REPRODUCERS
AID THE SCR-299
"Winning the Battle of Communications!"
The latest development in military communications equipment deserves the best in speech reproducers . . . it is natural, therefore, that Jensen speech reproducers were specified for the famous SCR-299, the high powered mobile communications unit as built by Hallicrafters. Jensen speech reproducers are serving with equal distinction in all branches of the armed forces.
Jensen
RADIO MANUFACTURING COMPANY
6601 SOUTH LARAMIE AVENUE
U. S. A.

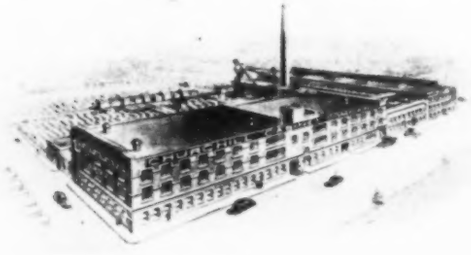


CHURCHILL-MADE CABINETS *Can take it!*

Yes, they are doing a mighty big job as a vital part of the Hallicrafters-built SCR-299. Dependable equipment built by Churchill Cabinet Company is constructed to stand the gruelling effects of warfare. Proof of their dependability is the job they are doing with the excellent transmitting unit, the SCR-299, built by Hallicrafters.

In peacetime, Churchill manufactured the highest quality communications and radio cabinets. These cabinets shall again be available when victory is ours.

CHURCHILL CABINET COMPANY INVITES INQUIRIES FOR POST-WAR PLANNING COOPERATION



TWO OF OUR PEACETIME COMMUNICATIONS PRODUCTS



By Invitation Member

CHURCHILL CABINET COMPANY

2119 CHURCHILL STREET · CHICAGO 47, ILLINOIS

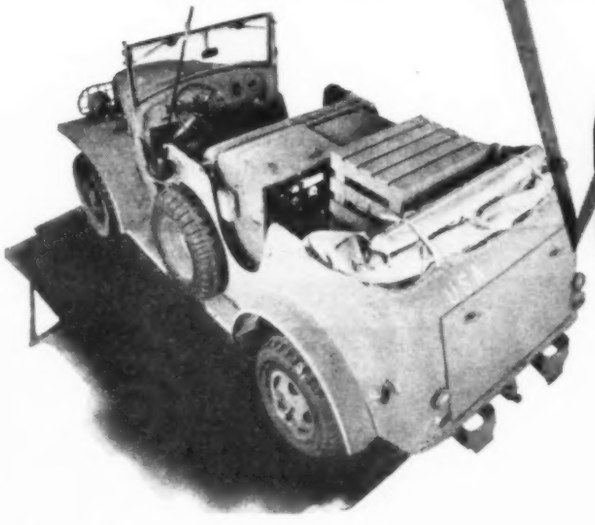
Working Together to Save Lives



SCR-543 Made by Hallicrafters
PE-108 Made by Pioneer

Stout hearted men and stout hearted equipment are winning battles for America and the Allied Nations all over the world. The special job of the SCR-543 is to provide communications for anti-aircraft artillery. It's got to be dependable. It's got to take punishment. Lives hang in the balance. We're proud of the way this communications set meets these stiff requirements.

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PINCOR Products

PIONEER GEN-E-MOTOR

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BUY MORE WAR BONDS



Doing A GREAT JOB . . . . . .

contributing toward the successful operation of the Hallicrafters-built SCR-299.

That Englewood cable connectors and accessories are used in the manufacture of this mighty communications war-weapon is a fine tribute to Englewood's ability to supply fine electronic components.

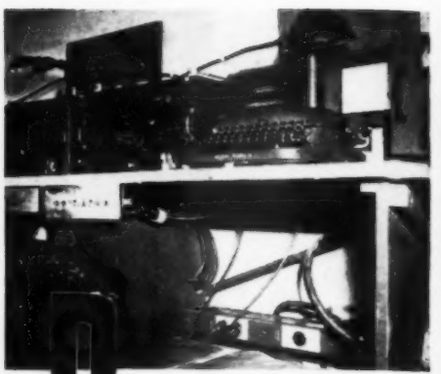


ADDITIONAL EQUIPMENT FURNISHED FOR THE SCR-299 BY ENGLEWOOD:

SPEAKING TUBE ASSEMBLY — *TROUBLE LAMP ASSEMBLY*
GROUNDING JUMPER AND LEADS — *POWER CABLE REEL*

ENGLEWOOD ELECTRICAL SUPPLY CO.

325 N. LAFAYETTE BLVD. SOUTH BEND, INDIANA
5801 SO. HALSTED ST. CHICAGO 21, ILLINOIS
120 N. FIRST STREET ROCKFORD, ILLINOIS



PROTECTION . . .

against adverse climatic conditions and rough usage is afforded the communications equipment in the Hallicrafters-built SCR-299, by Grunwald Plating.

Grunwald specializes in plating zinc, nickel, chromium, cadmium and copper and has special equipment and machinery for polishing inside surfaces.

Oxidizing and lacquering . . . Polishing and Buffing of all metals. Mechanical Plating, Pickling Stainless Steel and all metals.

Grunwald Production Specialists are at your service.

The GRUNWALD PLATING CO. Inc.

2559 W. 21st STREET CHICAGO 8, ILLINOIS

Supplying Electrical Needs *On Time* TO THE HALLICRAFTERS

As a leading electrical wholesaler serving the Chicago area, we are proud to have contributed to the success and accomplishments of one of the Army's most valuable "weapons" —the versatile SCR-299, manufactured by The Hallicrafters Co.

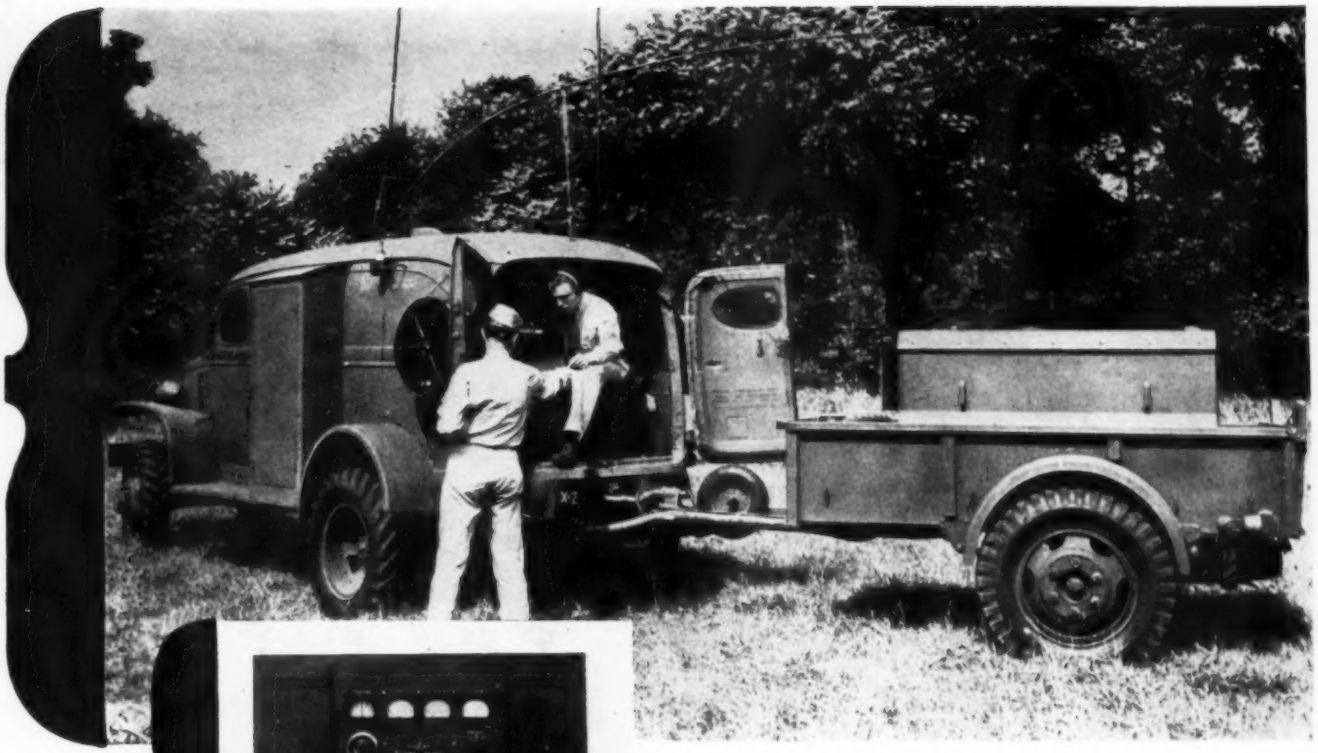
It gives us great satisfaction that Efengee's experienced expediters are aiding The Hallicrafters Co., and war industry in general throughout the Chicago area, with a service that is complete, cooperative and dependable.

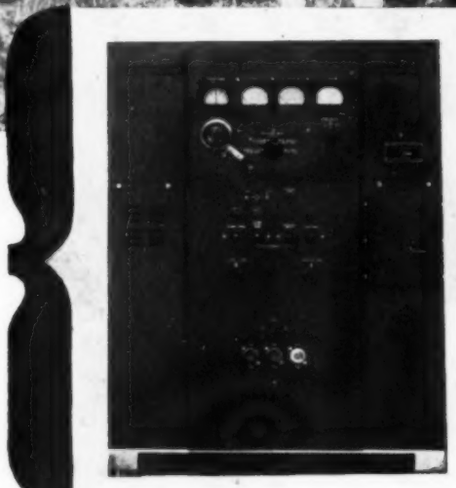
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ELECTRICAL SUPPLY CO.

Wholesalers of Everything Electrical

671 W. Washington Blvd., Chicago, Hay. 8340





JOHNSON

Condensers
Tube Sockets
Couplings
Insulators

·are used in the famous

HALLICRAFTER BUILT SCR-299

JOHNSON'S are proud of their part in furnishing many of the important components for this famous transmitter. They are proud to have been selected originally by HALLICRAFTERS to furnish these components for the HT-4—before the pressure of war made price unimportant. They are proud that this same HT-4 was used by the Signal Corps to become a part of the SCR-299—a tribute to the dependability of HALLICRAFTERS equipment and JOHNSON parts. They are proud to have been able to expand production to furnish all of these parts needed in the SCR-299 in addition to the vast numbers of parts needed by other manufacturers. And, we are proud that these are all standard parts made to the same specifications as our "ham" parts before the War.



Write for CATALOG 967Z

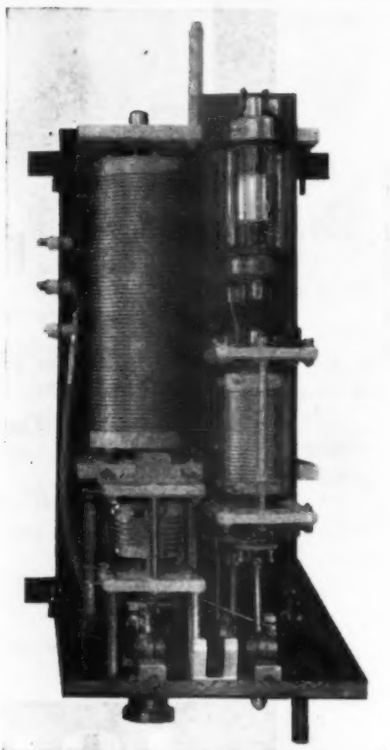
JOHNSON
a famous name in Radio

E. F. JOHNSON COMPANY • WASECA • MINNESOTA

TRANSMITTING TUBES AND VACUUM CONDENSERS



Jennings RADIO



TRANSMITTING TUBES and VACUUM CONDENSERS

Serving the Radio-Electronic Field with the Armed Forces

OVER a period of hears, the name JENNINGS has been associated with many of the outstanding developments in the Radio Industrial field.

Today, JENNINGS RADIO enjoys a well-earned nitch in the top flight ranks of Radio manufacturers now serving the armed forces.

Tomorrow, the post-war period, will find JENNINGS RADIO far out in front with a new and improved line of Radio Tubes and Vacuum Condensers meeting the exacting needs of the new industrial-electronic world.

While today, we are devoting our entire engineering thought and output to the business of winning the war, we can, however, invite a discussion of your commercial peacetime products.

Cur new catalog will be sent on request

JENNINGS RADIO MANUFACTURING CO.
San Jose, California

hallicrafters
SCR-299
is being powered by
JENNINGS
Transmitting Tubes
and Vacuum Condensers

"The World's Largest Aids the World's Largest!"

Howard Manufacturing Company is the world's largest manufacturer of crystal holders, as is Hallicrafters the world's largest exclusive manufacturer of short wave radio equipment.

Today, Howard is manufacturing plastic electronic parts for the war effort and is supplying crystal holders, used in the Hallicrafters-built SCR-299 Communications Truck.

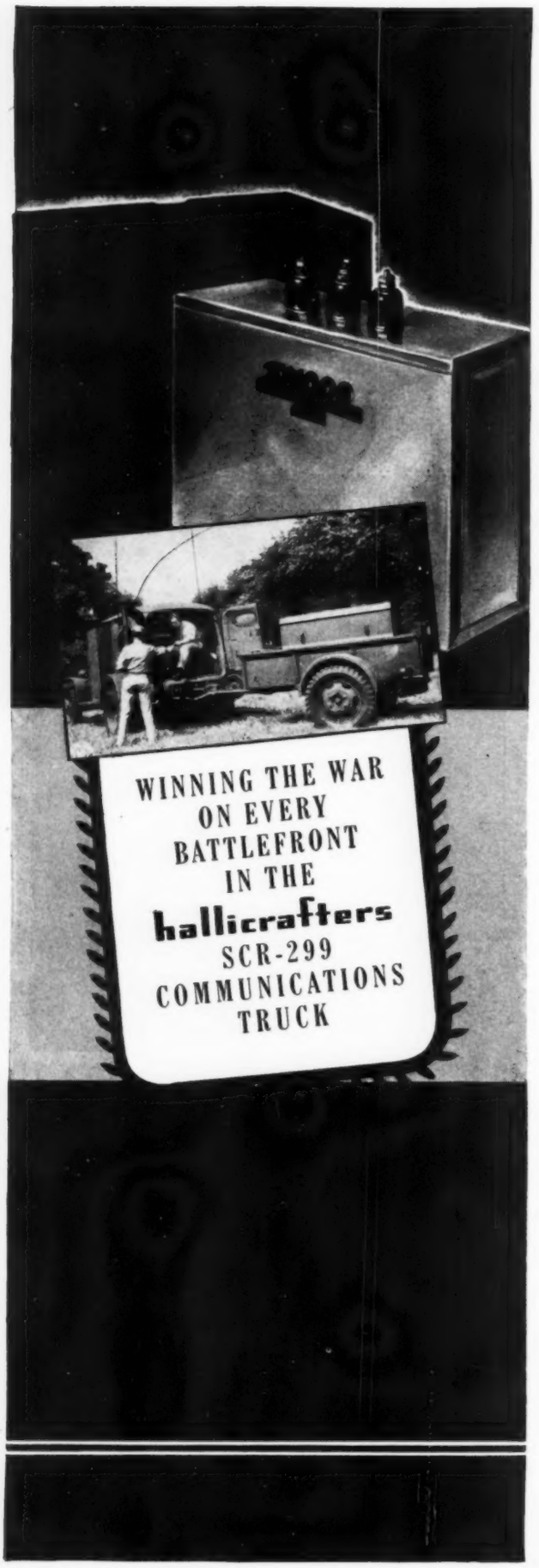
Tomorrow, Howard will be manufacturing parts for the great Peace-time Electronic Industry.





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For the Fighting SCR-299...

PILOT LIGHT ASSEMBLIES

By DIALCO

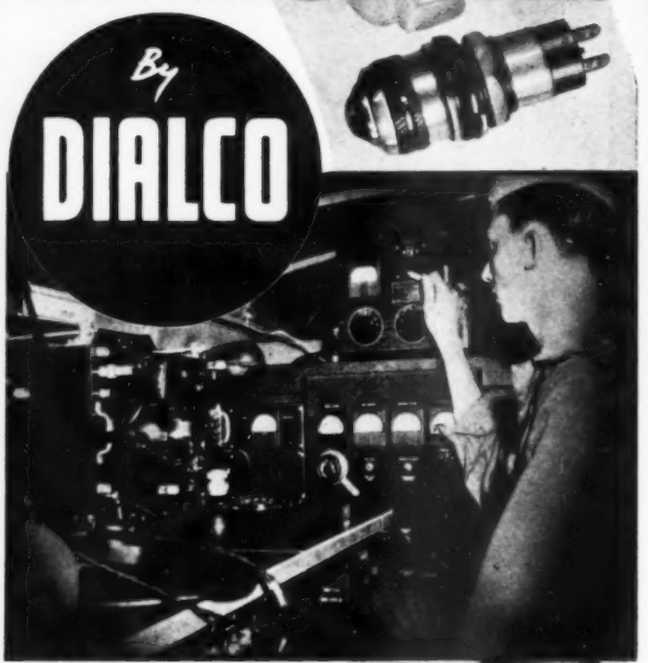


Photo courtesy U. S. Army Signal Corps

Here illustrated are a few of the types of Dialco Pilot Light Assemblies serving in Electrical-Electronic Apparatus in Planes, Tanks, Ships, etc.



Exactly "what" and "how" may not be told. But Dialco quality and rapid-fire service are no secret . . . and it is a fact that, in the extensive Dialco line, were found the *ideal Pilot Light Assemblies to meet the exacting requirements of the Army's fighting SCR-299.*

There's a Dialco Pilot Light Assembly for every known Electrical-Electronic application. Write us about your problem, and request a copy of our 24-page catalog, now!



DIAL LIGHT CO. OF AMERICA, Inc.
90 WEST STREET • NEW YORK (6), N. Y.

MANUFACTURERS OF RADIO TELEGRAPH APPARATUS DEVELOPED AND DESIGNED BY THE WORLD'S CHAMPION RADIO TELEGRAPHER

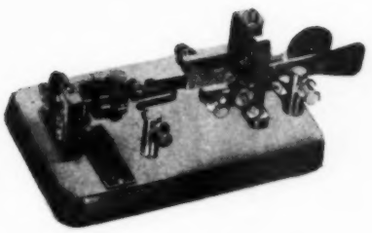


MS-700 MASTER OSCILLATONE

A very fine code Oscillator, encased in a beautiful bakelite cabinet.

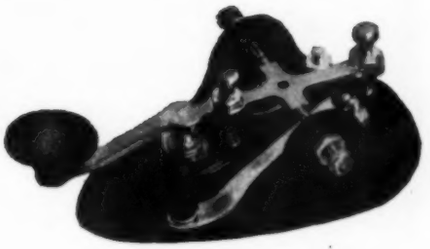
Especially designed for individual or class code learning. Features incorporated are: Continuously variable volume control, tone adjustable from 500 to 1500 cycles; provisions for disconnecting or connecting the speaker when phones are used. Terminals are provided for head phones and any number up to 300 may be used by connecting the phones in parallel, with no other matching devices.

The head phone circuit is completely isolated from any direct current, permitting phones with exposed terminals to be used without danger of shock. Operates on 110 volts AC or DC current. Either a 117N7GT or 117P7GT is used.



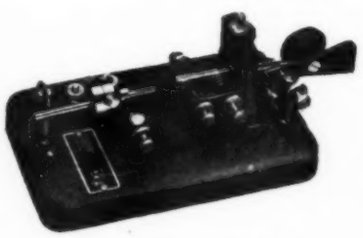
MODEL CP800 DELUXE SPEED KEY

The finest commercial or amateur bug available. A masterpiece of mechanical craftsmanship and precision workmanship. The massive base is finished in a highly polished chrome, as well as all the metal parts of the super-structure and lever. The main and U-spring are of carefully selected blue spring steel, resulting in uniform performance in all keys. Contacts are 3/16" in diameter. This bug is fully adjustable to suit the particular feel of any operator. Equipped with connecting cord.



MODEL 200 HAND KEY

A professional telegraph key in performance and appearance, using 3/16 inch coin silver contacts. The scientifically designed key lever is balanced between two accurately machined bearing screws and the entire key is mounted on a black crackle finished metal base, equipped with a circuit closing switch.



MODEL CP-500 SPEED KEY

A professional Speed Key, designed by the world's champion telegrapher. This Bug was designed to conform with the United States Navy specifications. Finished in a battleship gray wrinkle enamel and polished chrome. It is a masterpiece of mechanical craftsmanship and precision workmanship.

Rhythmical Morse sending is a real pleasure with this key. The contact points are 3/16 inch silver, right and left arm tension springs, contact spacings and vibrating arm are all fully adjustable. Size $3\frac{3}{4}$x$6\frac{1}{4}$x$3\frac{1}{4}$.



MODEL 300 DELUXE HAND KEY

The ultimate in fine telegraph keys. Finished in polished chrome and nickel. Its sturdy, balanced construction gives a feeling of smooth effortless keying. Contacts are 3/16" in diameter, adjustable for tension, spacing and bearing position. Equipped with a circuit closing switch.



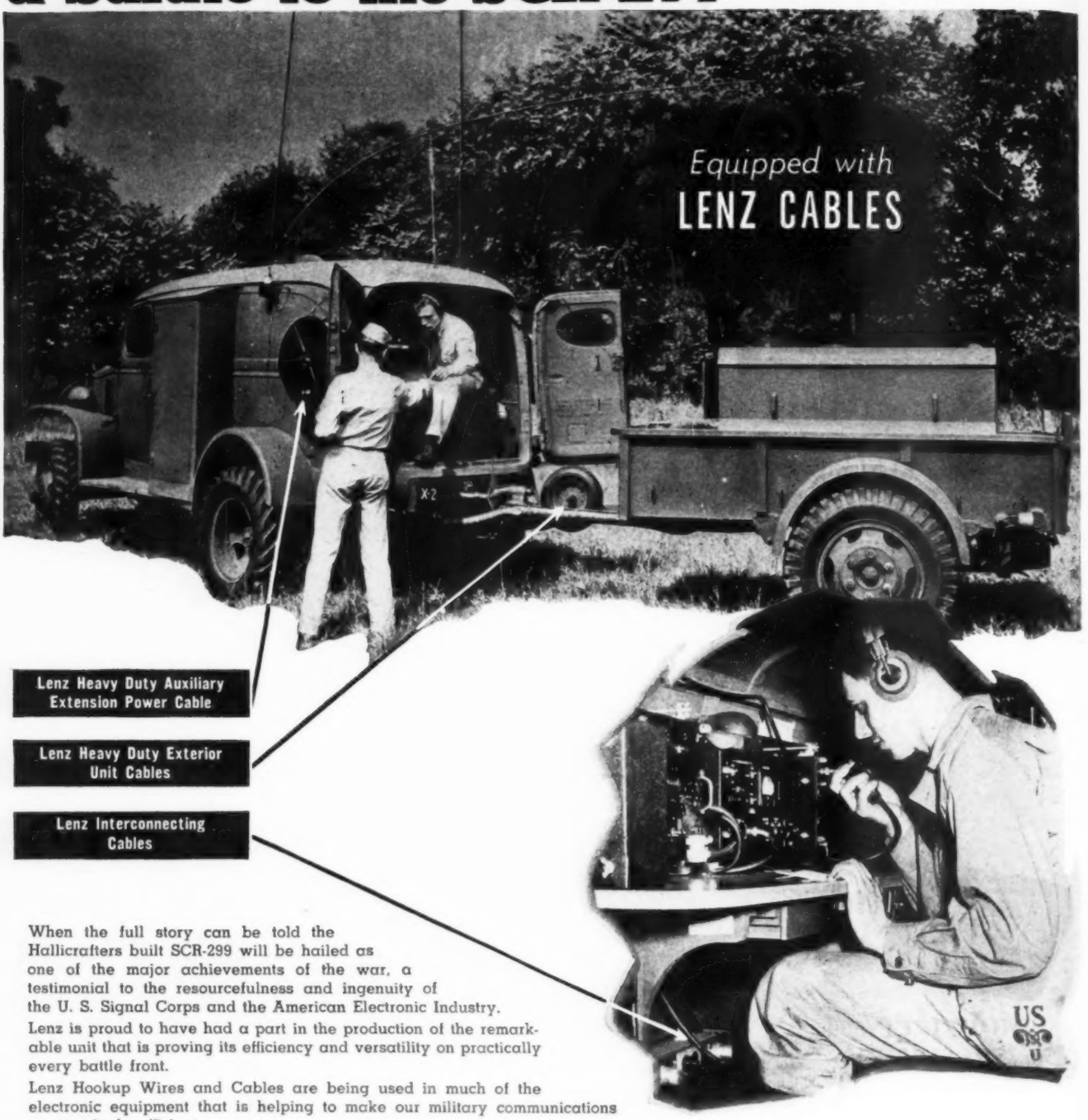
MS700-P CODE PRACTICE SET

An ideal practice set that is being used extensively by all branches of the armed forces for learning code and maintaining speed at inactive intervals. External connections are provided for additional keys and headphones. All of the features in the MS700 are incorporated in this unit.

TELEGRAPH Apparatus Co. Not Inc.

325 WEST HURON STREET • CHICAGO, ILLINOIS

a Salute to the SCR-299



When the full story can be told the Hallicrafters built SCR-299 will be hailed as one of the major achievements of the war, a testimonial to the resourcefulness and ingenuity of the U. S. Signal Corps and the American Electronic Industry.

Lenz is proud to have had a part in the production of the remarkable unit that is proving its efficiency and versatility on practically every battle front.

Lenz Hookup Wires and Cables are being used in much of the electronic equipment that is helping to make our military communications so amazingly efficient.

Many of these wires and cables were especially engineered to meet unusual and severe operating conditions. The Lenz Wire and Cable technicians are always ready to consult with designers of electronic equipment on any wire problem.

LENZ ELECTRIC MANUFACTURING COMPANY

1751 No. Western Avenue, Chicago 47, Ill.

In Business Since 1904

LENZ

Hook Up Wires and Cables



WE'RE HELPING HALLICRAFTERS

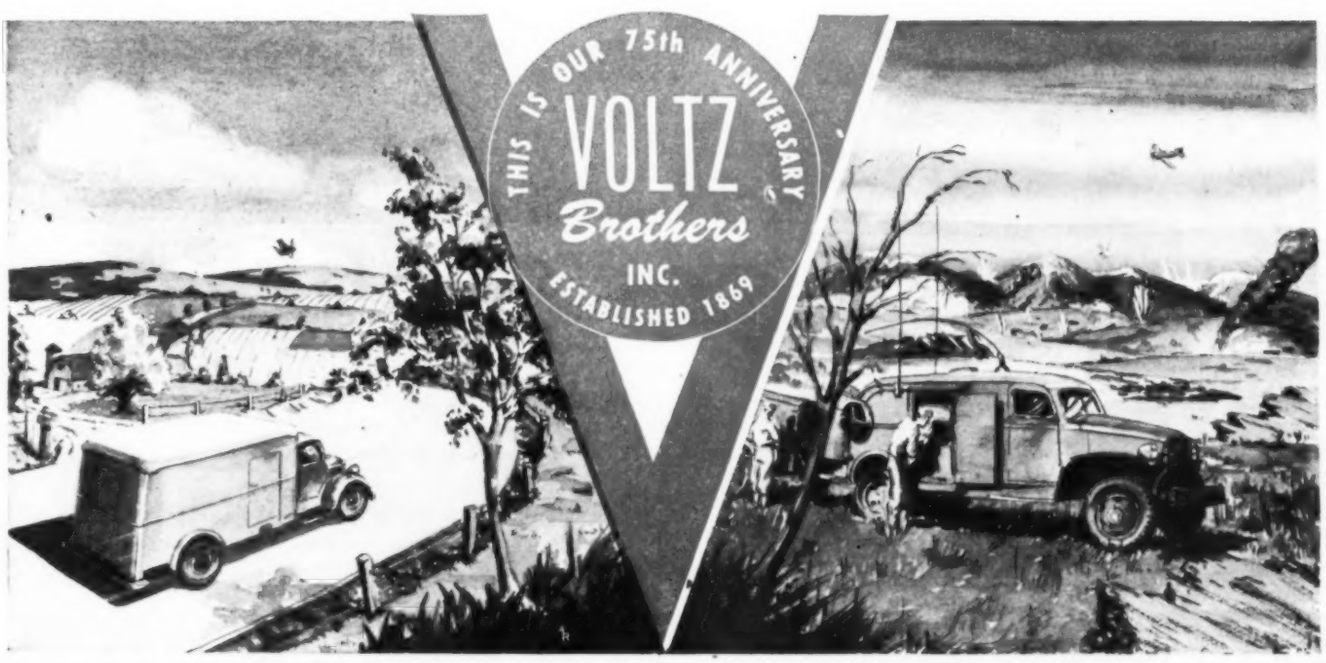
and proud of the privilege

Ours is a modest role in the supporting cast of a tremendous drama . . . we're *helping Hallicrafters to make communications history.*

Our job in the creation of the SCR-299 includes the modification and preparation of the truck for the installation of the radio unit, the conditioning of the trailer for the installation of the power plant, and the fabrication of such accessories as chests, battery boxes, backboards, reel assemblies and carriers.

It may be a minor part, but in the production of so vital an instrument of war, *every* assignment is of critical importance. We are putting into ours everything we have in experience, energy, facilities and integrity.

This year we are observing our 75th anniversary. Before its close we hope also to celebrate the end of the war. Look to us then, with broadened experience and expanded facilities, not only to resume our service to pre-war customers, but to assist in the manufacture of post-war products. If any part of *your* post-war product calls for wood or steel fabrication, we would welcome the opportunity of discussing our facilities with you . . . *Voltz Bros., Inc., 215 E. 29th Street, Chicago 16, Ill.*



From fine custom-built truck bodies to cooperation in the creation of wartime mobile radio units was a logical step, quickly taken by Voltz Bros., Inc., after Pearl Harbor. When Pearl Harbor is avenged we plan, just as quickly, to resume and expand our service to civilian clients.

When in Quest of the BEST...

CTX

"Connect with"

AERO

Manufacturers of multiple electric cable connectors. Now assisting HALLICRAFTERS with parts for the famous SCR-299.

AERO · ELECTRIC · CORPORATION

LOS ANGELES CALIFORNIA



Micamold

SALUTES HALLICRAFTERS

HELP
SHORTEN
THE WAR
. . . . . .
BACK THE
FOURTH WAR
LOAN DRIVE

An outstanding development to emerge from the war is the Hallicrafters SCR-299, a radio transmitting and receiving station that may be used at the front either as a mobile or stationary unit. Sending clear messages up to 100 miles the SCR-299 has, to date, served in all theatres of war to much applause from the military services.

MICAMOLD salutes Hallicrafters for this accomplishment, and takes pride in the fact that our capacitors have become an integral part of the SCR-299. Here's definite proof, once again, of *Micamold* preference wherever and whenever dependability is desired.

Remember . . . there's a Micamold Capacitator for all radionic and electrical applications.

MICAMOLD RADIO CORPORATION

1087 FLUSHING AVENUE BROOKLYN 6, N. Y.

A SALUTE TO THE SCR-299



ENGINEERS
DESIGNERS
BUILDERS

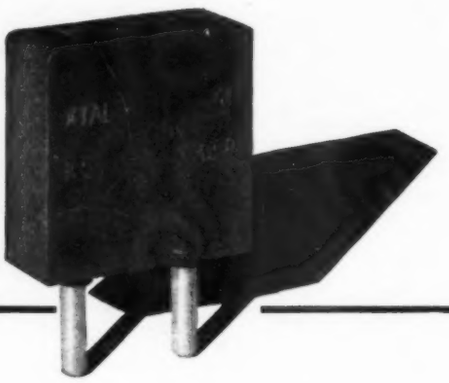
McClintock congratulates HALLICRAFTERS on the recognition accorded SCR-299 and is proud to have a part in the production of this superior equipment

Power Instruments

BY O. B. McCLINTOCK CO.

MINNEAPOLIS • MINNESOTA

Ingenuity . . .



The Hallicrafters Company has repeatedly demonstrated its proficiency in the development of communications equipment for use in all fields. Past experience has paved the way to perfection in its every endeavor.

We, too, are drawing upon a vast reservoir of experience in meeting the exacting specifications and high standards of quality necessary for component parts of Hallicrafters equipment. We are ever watchful for possible improvement in design or method. Here is an example:

A major wartime crystal problem arose in the "plastic holder" which contains the oscillating blank. Soldered or bolted connections were insecure; solder flux melted at high temperature; impaired crystal operation; drill particles vibrated loose into the holder cavity; pin entries permitted leakage.

Our engineers saw these defects, refused to believe that new plastic molding techniques were impossible.

The result:
Henry developed a revolutionary new type holder. Pins, contact plates are now welded permanently together—molded as an integral part of the complete holder. This new holder is now available to the industry in a number of different types.

Thus, cleaner, sturdier, tighter crystal holders than any previously made are now being manufactured and satisfactorily used by our Armed Forces. Another apparently impossible task has been accomplished. Through war . . . into peace . . . look to Henry for the manufacture of Radio Equipment which will help you accomplish the seemingly impossible.

MEMBER OF WEST COAST ELECTRONICS MANUFACTURERS

HENRY *Manufacturing Company*

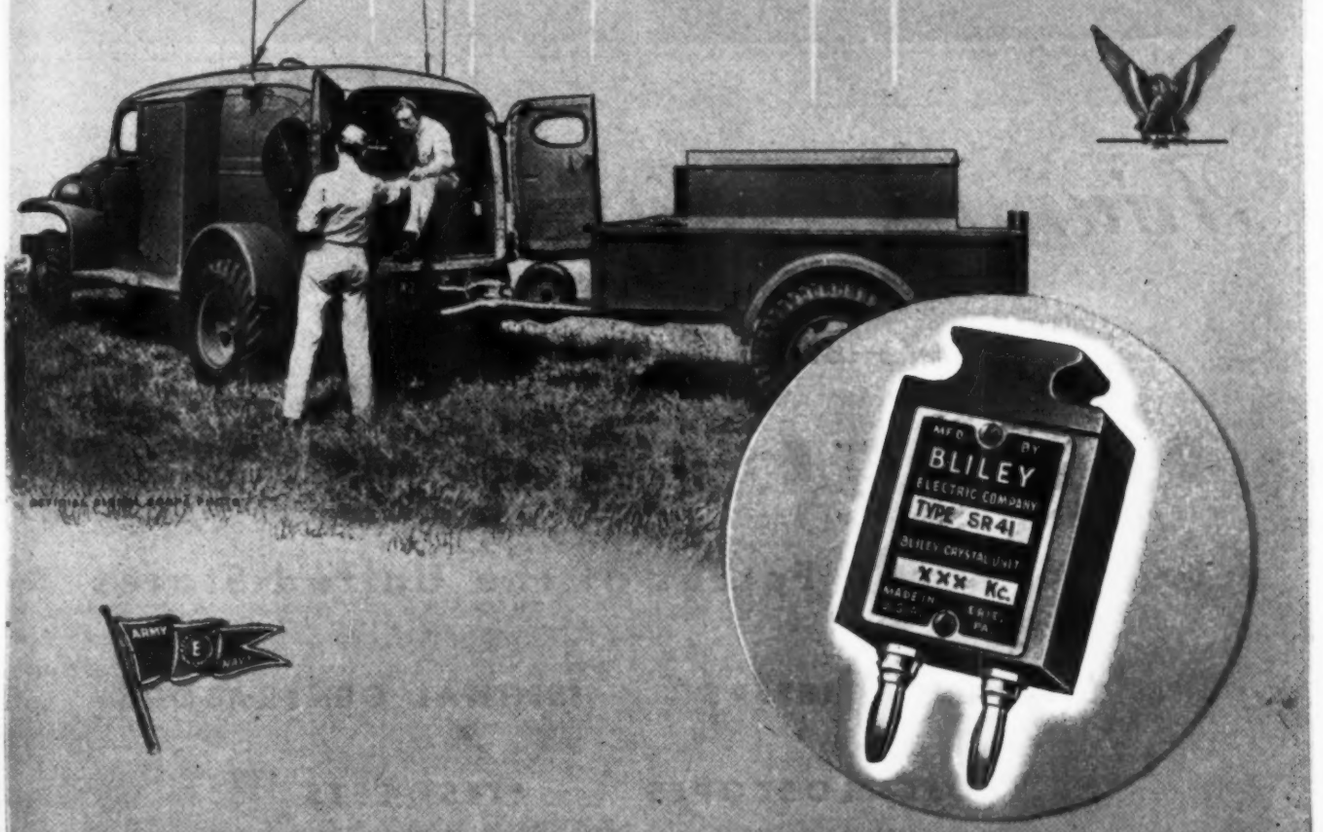
2213 WESTWOOD BOULEVARD • LOS ANGELES 25 • CALIFORNIA

MANUFACTURERS • ENGINEERS • PIEZO ELECTRIC QUARTZ CRYSTALS

BLILEY CRYSTALS
RIDE WITH THE SCR-299
Built by hallicrafters

ONE of the outstanding achievements in wartime radio transmitter design is the SCR-299. Serving equally well as a mobile or stationary radio station, this now famous equipment is doing a real job on our battle fronts.

This war is run by radio. The vital importance of maintaining reliable communications necessitates the selection of quartz crystal units that are accurate and dependable. Bliley Crystals are engineered for service . . . they are used in all branches of military communications and are, of course, supplied for the SCR-299.



BLILEY ELECTRIC CO., ERIE, PA.

Manufacturers of component parts for the Radio, Electronic and Communications Industries; supplying parts for The Hallicrafters built SCR-299.

★ DEPENDABLE MUTER PRODUCTS ★ MUTER PRODUCTS ★ DEPENDABLE MUTER PRODUCTS ★

THE MUTER CO.
1255 SOUTH MICHIGAN AVENUE
CHICAGO, U. S. A.



Triumph Mfg. Co.

—precision builders of

RADIO TEST EQUIPMENT

for the Armed Forces of the United States

•MULTI-RANGE METERS •SIGNAL GENERATORS

•OSCILLOSCOPES •TEST SETS

TRIUMPH MFG. CO. · CHICAGO, ILLINOIS



This high-powered Hallicrafters mobile transmitter, using RCA Tubes, was developed as a result of U.S. Signal Corps demand for a set that could stand "blitz" warfare.

Photo Courtesy U. S. Army Signal Corps

Salute to the brilliant use of RCA Tubes!

SIDE by side with our fighting men throughout the world's battle fronts, mobile radio units carry on the vital battle of communications.

Built to U.S. Signal Corps requirements, mobile unit SCR-299 has performed with almost phenomenal success—in Tunisia, Sicily, China, Italy—wherever our troops have fought and are fighting today.

Specifications for the SCR-299 called for a radio set and components capable of transmitting (by voice) up to 100 miles while the fast-moving armored unit was traveling over mud-rutted roads, through woods, and over the roughest terrain. Under actual emergency conditions they have communicated successfully over a distance of 2300 miles (UHF).

As one of the principal suppliers of the *tubes* that "power" the Hallicrafters transmitting equipment in the SCR-299, RCA takes this occasion to salute the U.S. Signal Corps, the Hallicrafters organization, and the members of our fighting forces who are making such brilliant use of their equipment.

The men and women of RCA, who are today devoting all their technical "know how" to building dependable wartime tubes, realize, possibly better than any other civilians can appreciate, that this is very largely an *electronic* war. And because they know that the Magic Brain of all electronic equipment is a tube, they take pride in the fact that the fountain-head of modern tube development is RCA.

BUY MORE WAR BONDS

RADIO CORPORATION OF AMERICA



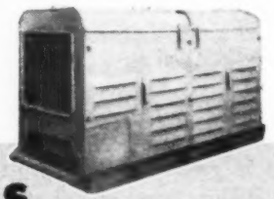
Meet the other half of the SCR-299 team — the Onan Electric Generating Plants! They provide a reliable, independent supply of electric power for the SCR-299's and were selected because they are rugged, well engineered power units, capable of continuous operation in any climate or temperature, under the most adverse conditions.

Reports from fields of action pay glowing tribute to the uninterrupted service Onan units render during long, punishing periods of operation. When the success of a campaign depends on the SCR-299 delivering the message, the Onan Electric Plant backs it up with adequate power always!

Here is another example of teamwork in U. S. war production. D. W. Onan and Sons are proud that their Electric Plants were selected to team up with so effective a weapon as the Hallicrafters -built SCR-299!

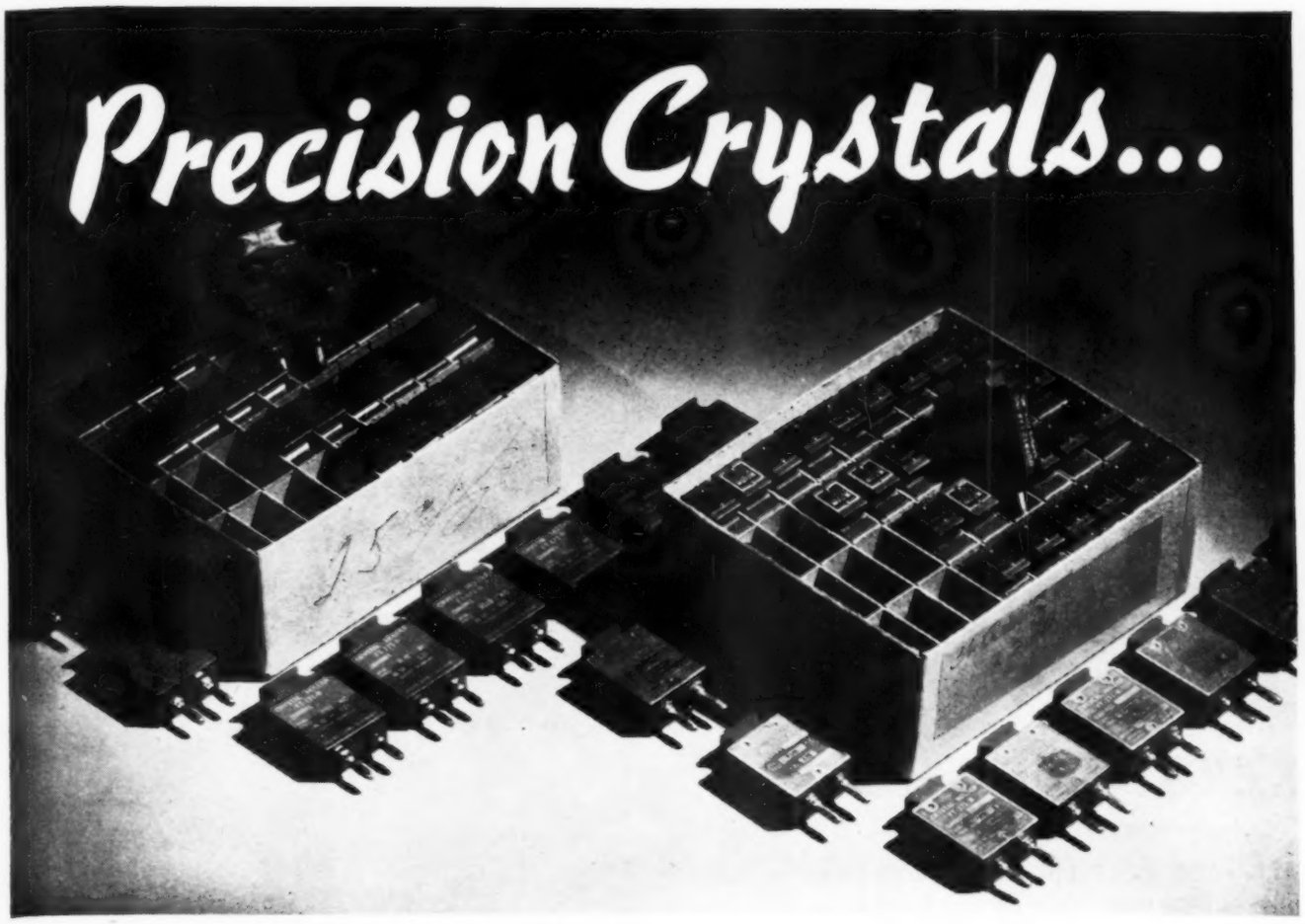
ARMY-NAVY E AWARDED TO PERSONNEL OF ALL FOUR ONAN MANUFACTURING PLANTS

ONAN



Onan Electric Generating Plant JWC-4-10S, newest model on which the Hallicrafters transmitter depends for its electric power. It is featured by many improvements for ease and safety of operation.

D. W. ONAN & SONS
39-51 ROYALSTON AVENUE
MINNEAPOLIS, MINNESOTA



FOR AN EXACTING JOB!

Precision crystals for wartime uses must be *free* from electrical and optical flaws and must also be *free* from dust. Quartz Laboratories engineering methods and manufacturing procedure insures the most dependable products.

Continuous and indefinite operation, required of communications equipment, demands the highest quality component parts. Quartz Laboratories crystals are meeting the most rigid specifications of the Signal Corps as integral parts of the Hallicrafters-built SCR-299, 399, and 499. The crystals for the SCR-543 proposed especially difficult problems and Quartz Laboratories was able to solve them.

Quartz Laboratories is proud to have its products serving with the famous mobile communications units built by Hallicrafters.



QUARTZ LABORATORIES
1513 OAK STREET
KANSAS CITY 8, MISSOURI

A Communications

MASTERPIECE

Using Keystone-Piezo Crystals!

The SCR-299 is representative of the ingenuity of the Signal Corps and American engineers and this mobile unit is more than living up to the communication requirements of war.

Keystone-Piezo crystals are used in the SCR-299 and are guaranteeing faithful reception even under the most extreme conditions.





KEYSTONE-PIEZO

COMPANY

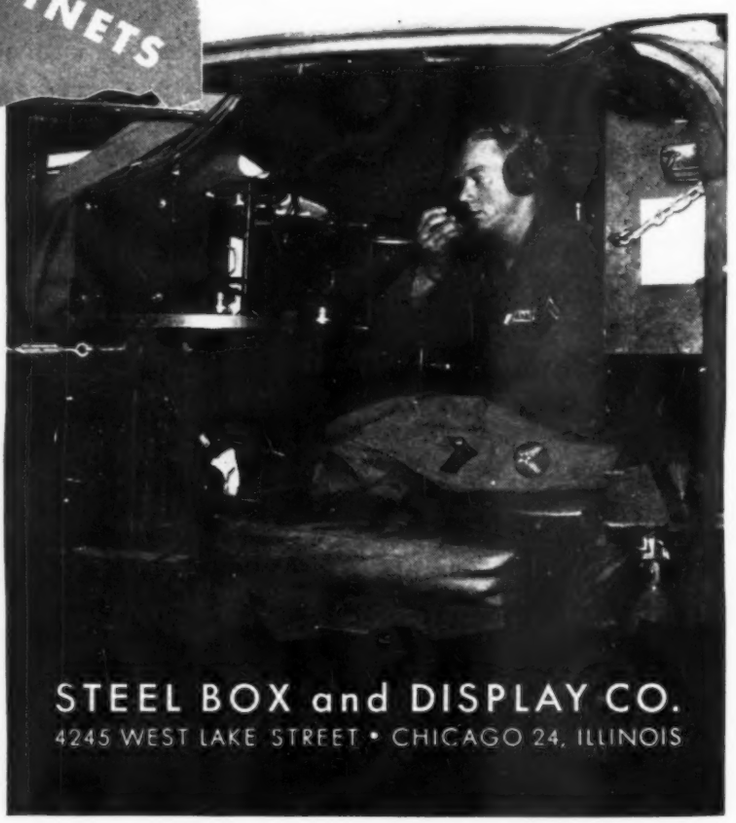
2020 WEST LIBERTY AVENUE

PITTSBURGH 22, PENNSYLVANIA

BOXES CHASSIS CABINETS

Steel Box and Display Company products house transmitting and receiving units used in the SCR-299 built by Hallicrafters . . . and offer the greatest possible protection for these units against the rigors of war.

Communication lines must be kept open and the SCR-299 is DOING THE JOB! This would not be possible if *all* the component parts of this high powered unit were not of the highest quality. Steel Box and Display Company products more than meet the standards set up for this truck.



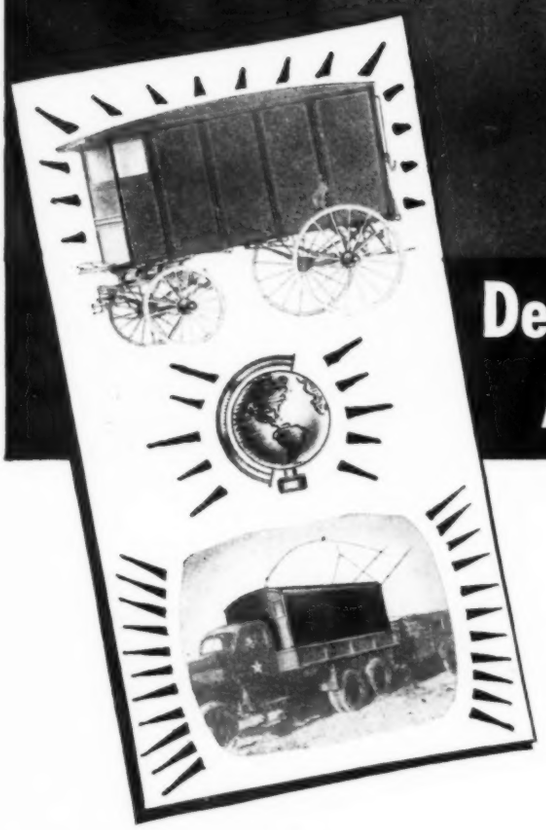
STEEL BOX and DISPLAY CO.

4245 WEST LAKE STREET • CHICAGO 24, ILLINOIS



De Kalb's Proudest Assignment

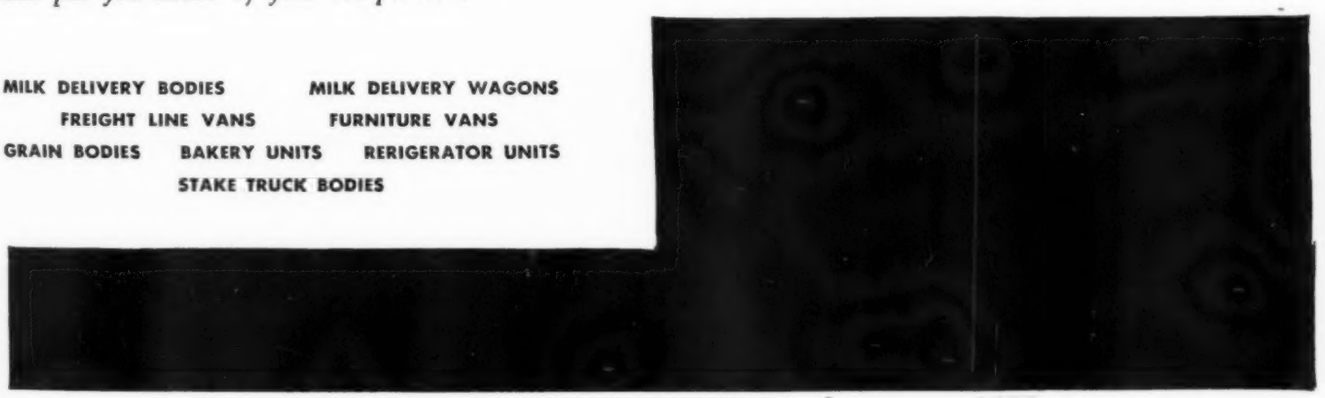
in 38 Years of Body Building



For 38 years, De Kalb has kept a step ahead of developments in automotive design and modern delivery needs. Our latest body designs, for your delivery needs, are again ahead of the times and will put you ahead of your competition.

De Kalb's earliest custom-built bodies were drawn by horses. Today, Mobile Radio Shelters built by De Kalb are fighting the "Four Horsemen" of War. Thirty-eight years of "know how" are behind every turn of a bolt on these Mobile Radio Shelters. If quick, economical delivery is part of your post-war distribution plan, that plan should include De Kalb-built Bodies. Our engineering department, now working on advanced body designs, can provide the perfect solution for your delivery problem. Let us know your future delivery needs and we will make expert recommendations without cost or obligation.

MILK DELIVERY BODIES **MILK DELIVERY WAGONS**
FREIGHT LINE VANS **FURNITURE VANS**
GRAIN BODIES **BAKERY UNITS** **RERIGERATOR UNITS**
STAKE TRUCK BODIES



COMPONENTS ARE DOING A *Big Job*



Thousands of small, seemingly unimportant, components are necessary in the successful and continuous operation of the famous SCR-299 built by Hallicrafters.

Western Insulated Wire, Inc., supplies many of the necessary components for this mobile radio communications truck that is doing such a tremendously important job.

LISTED BELOW ARE COMPONENTS SUPPLIED FOR THE WAR EFFORT:

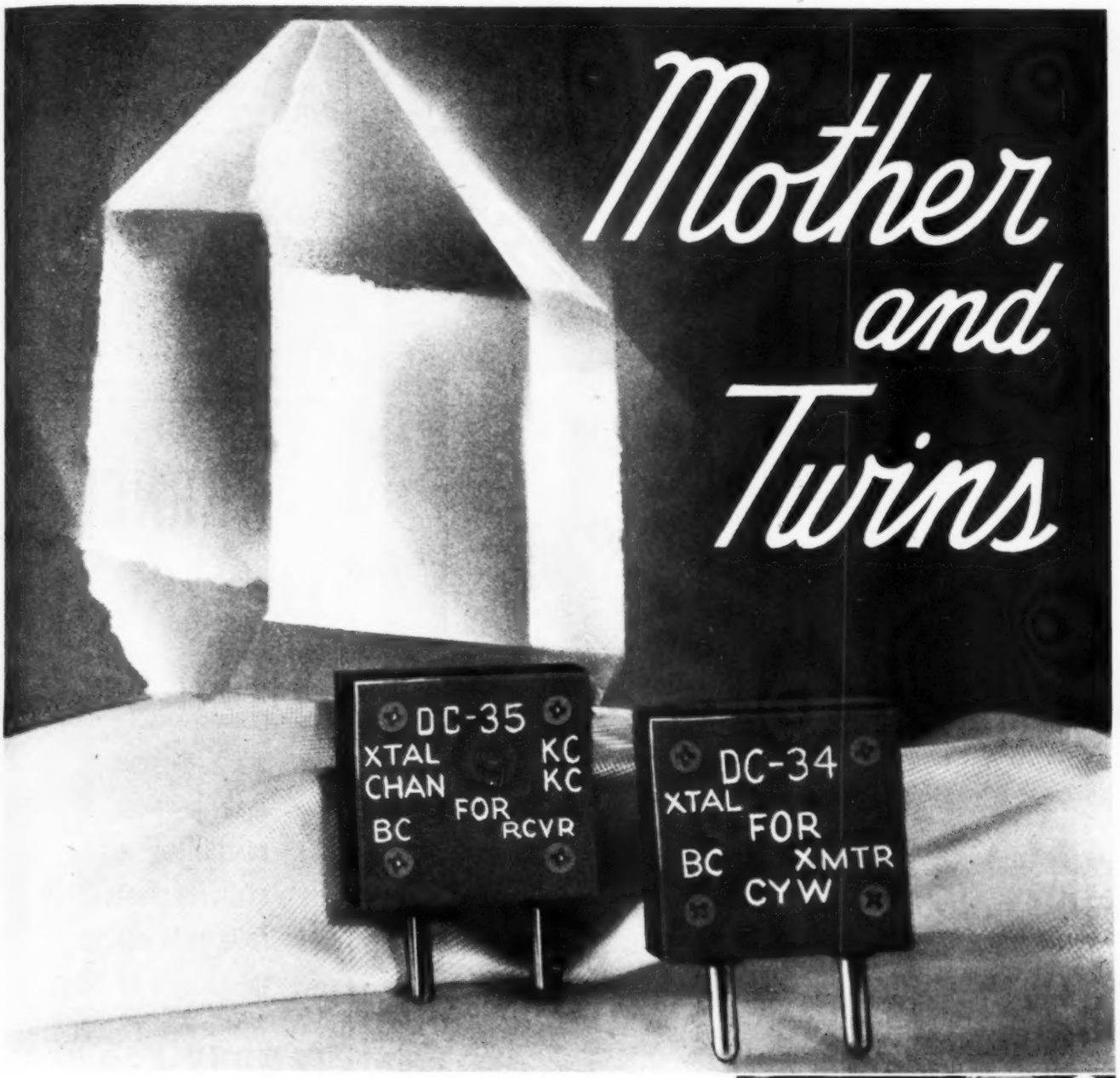
CONDUCTOR CABLES
AVIATION WIRES
RUBBER SHEATHED CORDS AND CABLES
SPECIFICATION WIRES
FLEXIBLE CORDS
SHIELDED RADIO WIRES AND CABLES
EXTRA FLEXIBLE WELDING CABLES

WESTERN

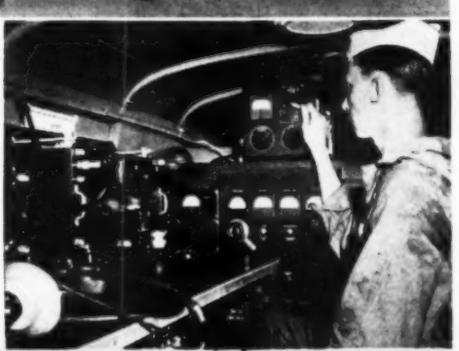
INSULATED WIRE, INC.

1001 EAST SIXTY-SECOND STREET, LOS ANGELES, CALIFORNIA

Mother and Twins



DC 34 and DC 35 perfect twin crystals, cut from a mother quartz. It takes the utmost in precision manufacturing to handle this perfect cutting and finishing job. But Wallace experience for the task includes making crystals for the famous Hallicrafter-built SCR 299. together with cable assemblies and other exacting wartime orders. This present day Wallace work is the type of experience and craftsmanship you'll want to help you produce your Peacetime products.



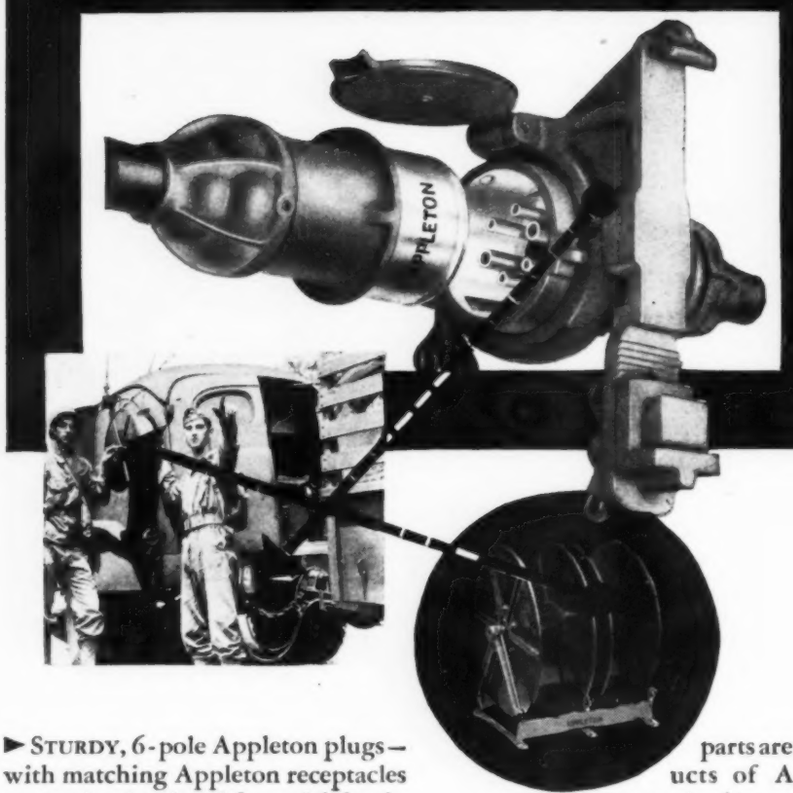
Wm. T. Wallace Mfg. Co.

General Offices: PERU, INDIANA

Cable Assembly Division: ROCHESTER, INDIANA

APPLETON PLUGS

Strong Life Line



► STURDY, 6-pole Appleton plugs—with matching Appleton receptacles conveniently placed for quick hook-up—feed the SCR-299 its juice. They're attached at the ends of the rugged cable, and extension cables, that carry power to the unit from the trailer.

Appleton builds the reel stands, too, on which the unit's lengths of telephone wire are coiled—an adaptation of the well-known Appleton "Reelite," used in thousands of industrial installations to keep electrical conductor cables taut, safe from kinks and other damage, yet instantly available for use.

Both specially-designed parts are products of Appleton's 40 years of engineering skill in the electrical fitting field. They are manufactured in Appleton's own plants, where advanced methods and precision standards are the rule. The entire Appleton organization is proud to have had a part in the development and production of the SCR-299.

If the same experience and manufacturing facilities can be of assistance to you, a 'phone call, telegram or letter will get Appleton's immediate cooperation.

APPLETON ELECTRIC COMPANY
1714 Wellington Ave., Chicago 13, Illinois

APPLETON ELECTRIC PRODUCTS

APPLETON

☆

Keep the World's Best Fighting Men equipped with the World's Best Tools of War.

☆

Speed the Day of Victory and the return of Our Fighting Men.

☆

BUY MORE BONDS!

WORNER ELECTRONIC ENGINEERS

are justly proud of their privilege in contributing especially engineered radio parts vital to the success of the

FAMOUS SCR-299

built by

HALLICRAFTERS

• • •

WE ARE NOW LOCATED IN OUR NEW PLANT AT 848 N. NOBLE ST. CHICAGO 22, ILL. TEL. MON. 8400

WORNER ELECTRONIC DEVICES

FIGHTING COMPONENTS *for* FIGHTING EQUIPMENT



B & W COILS *and* ANTENNA TUNERS *for the Hallicrafters-built* SCR-299



In the vanguard of invasion, you'll find the SCR-299 Mobile Radio Unit built by Hallicrafters—and, in this famous unit, you'll find B & W's specialized facilities well represented.

Standard B & W Air Inductors with rugged, armor-type construction take competent care of all amplifier plate coil requirements. Not only is the complete Antenna Tuning Unit a product of the specialized B & W facilities for electronic equipment production, but B & W engineers collaborated closely with Hallicrafters on its design and construction details.

Proud of their part in the SCR-299, B & W engineers welcome similar assignments where the utmost in performance, ruggedness, and dependability are prime considerations.

AIR INDUCTORS · VARIABLE AIR CONDENSERS
ELECTRONIC EQUIPMENT ASSEMBLY

B&W

BARKER & WILLIAMSON
235 FAIRFIELD AVENUE. UPPER DARBY, PA.

Exclusive Export Representatives: Lindeteves, Inc., 10 Rockefeller Plaza, New York, N. Y., U. S. A.





COAXIAL CABLES

ANDREW Coaxial Cables for the famous HALLICRAFTERS SCR-299

ANDREW Coaxial Cables are standard equipment on the Hallicrafters-built SCR-299: the mobile communications unit that is doing such an outstanding job on the fighting fronts. It is highly significant that ANDREW Coaxial Cables were chosen as a component of this superb communications unit.

The Andrew Company is a pioneer manufacturer of coaxial cables and accessories. The facilities of the Engineering Department are available to users of radio transmission equipment.

ANDREW CO.



DRY AIR PUMP



GAS-TIGHT TERMINAL

COAXIAL CABLES. The Andrew Company is now able to supply standard 70 ohm 7/8" soft temper coaxial cable in lengths up to 4,000 feet! The cable is electrically identical to rigid cables of equal size, but has these extra advantages: the cable may be uncoiled and bent by hand, thus greatly simplifying installation; no connectors, junction boxes or expansion fittings need be installed in the field; thus a big saving is made in installation time and labor.

DRY AIR PUMP. This hand-operated pump quickly, efficiently and economically dehydrates the air inside coaxial cables, in addition to having a multitude of other applications. It dries about 170 cubic ft. of free air, reducing humidity from 60% to 10%.

GAS-TIGHT TERMINAL. The new Andrew glass insulated terminal is an outstanding development that provides a 100% air-tight, gas-tight system for gas filled coaxial cables. A special design that minimizes shunt capacity makes this terminal ideally suited to high frequency operation.

COAXIAL ANTENNA. Suitable for fixed station use and pretuned at the factory to the desired operating frequency, the Andrew type 899 vertical coaxial antenna provides an efficient, easy-to-install, and inexpensive half-wave radiator in the frequency range from 30 to 200 MC. Careful engineering has utilized to the utmost the well known advantages of the coaxial antenna over other types of vertical half-wave antennas.

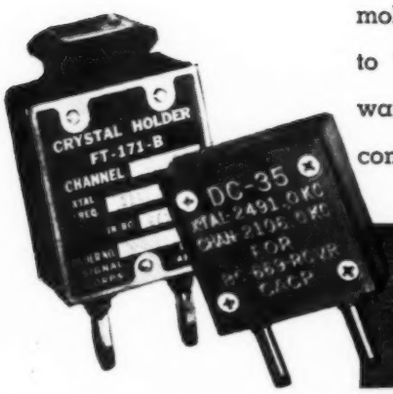
CATALOG DESCRIBING COAXIAL CABLES AND ACCESSORIES FREE ON REQUEST. WRITE FOR INFORMATION ON ANTENNAS AND TUNING AND PHASING EQUIPMENT.

THE ANDREW COMPANY • 363 EAST 75TH STREET • CHICAGO 19, ILLINOIS



DESIGNED FOR *War Duties*

Accuracy and Dependability are stern requisites for war use. These requirements are more than met in Pacific Radio Crystals as is proved by their service with the famous Hallicrafters-built SCR-299. This high-powered mobile communications unit has contributed so greatly to the victories of the Allied armed forces. When the war is ended, the full value of this great Signal Corps contribution shall be known.



PACIFIC RADIO CRYSTAL CO.

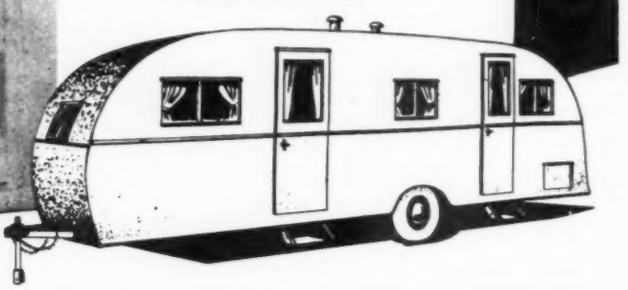
1035 POST STREET • SAN FRANCISCO 9, CALIFORNIA



DESIGNED...
FOR A JOB!
DOING...
A JOB!

The experience behind the manufacture of the "Alma Silvermoon," America's most Livable Trailer, enabled the Alma Trailer Company to meet the urgent demand for Mobile Radio Shelter Units ahead of schedule. Alma is proud of this opportunity to serve . . . as builders of HO17 Radio Shelters for the Signal Corps.

ALMA TRAILER COMPANY
ALMA, MICHIGAN





SIGNAL CORPS PHOTO

CONSOLIDATED WIRE AND ASSOCIATED COMPANIES

1635 SOUTH CLINTON STREET
CHICAGO 16, ILLINOIS

Wire Fights FOR VICTORY..
with the
HALLICRAFTERS-BUILT SCR-299!

Wire is definitely in this war in numerous ways. One great example of the contributions made by wire is the Signal Corps high-powered mobile transmitter. Many fine things have been said about this unit . . . many facts about its performance must remain a secret until victory is ours. Then we shall hear the complete story about the terrific job it is doing.

Wire of every type and description is used in the SCR-299. This wire must be the finest quality available in order to guarantee the best possible reception under fire, at high speeds and over rough terrain.

Consolidated Wire and Associated Companies supply numerous types of wire, *built to do the job*, for the SCR-299!



PRECISION

1889....1944



"Who Started This Talk of Precision?"

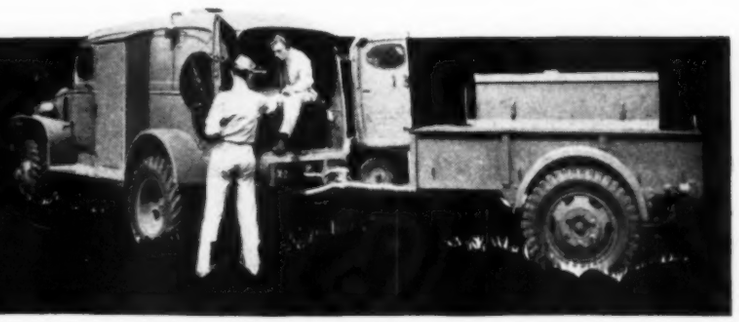
Frankly we don't know where it started but precision became a cornerstone in Wynne Precision Company 55 years ago when Dr. T. H. Wynne, Sr. made a fine watch, piece by piece. Since that time precision has been more than just a name; it has been an ever present policy.

Wynne Precision crystals are used in the SCR-299 built by Hallicrafters. This unit is the Signal Corps' and American Engineers' great contribution to the victories being won today by the Allied fighting forces. . . . 55 years of experience as craftsmen in metals, glass and gem stones, in a modest way, is helping the Allied Nations do a PRECISION job!

WYNNE

PRECISION COMPANY

Griffin, Georgia





The "Whip" that's Helping Whip the Axis!

● The "Whip" Antenna used on this Army SCR-299 Mobile Communications Unit is produced by the same Heddon Steel-drawing Process which has made Heddon "Pal" Steel Rods "fighting favorites" with fishermen everywhere.

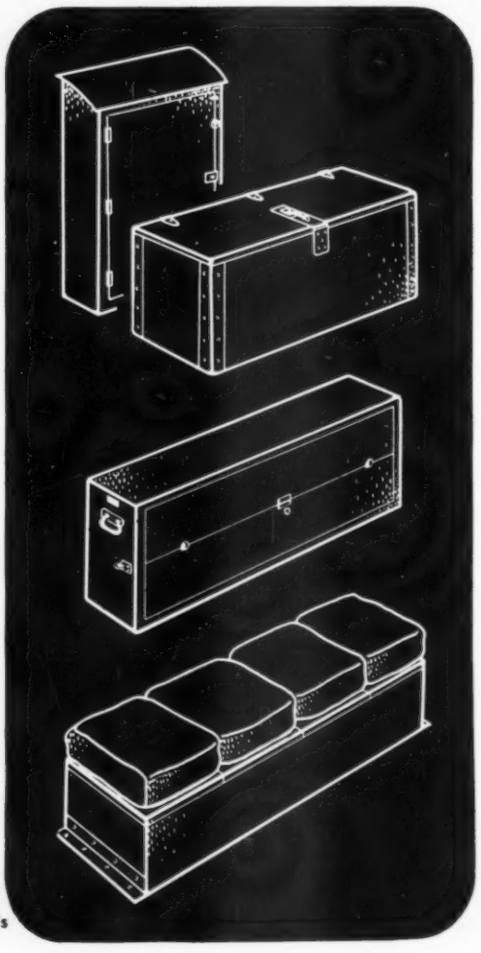
"Heddon-made is well-made"

James Heddon's Sons
DOWAGIAC, MICH.



H. C. EVANS
Contributes too!

EVANS is happy to salute the Hallicrafters-built SCR-299 high-powered mobile communications truck . . . and proud to manufacture for this unit several necessary accessories, among which are: Wall cabinets, tool chests, seat benches, and cabinets for the exterior of the truck. . . . Communication lines must be open under any circumstances if VICTORY is to be won in **any** battle . . . **the SCR-299 Is Doing the Job!**



EVAN'S SHOCKPROOF RELAY

Has been subjected to complete tests, including vibration tests by Aircraft Radio Laboratory.

★

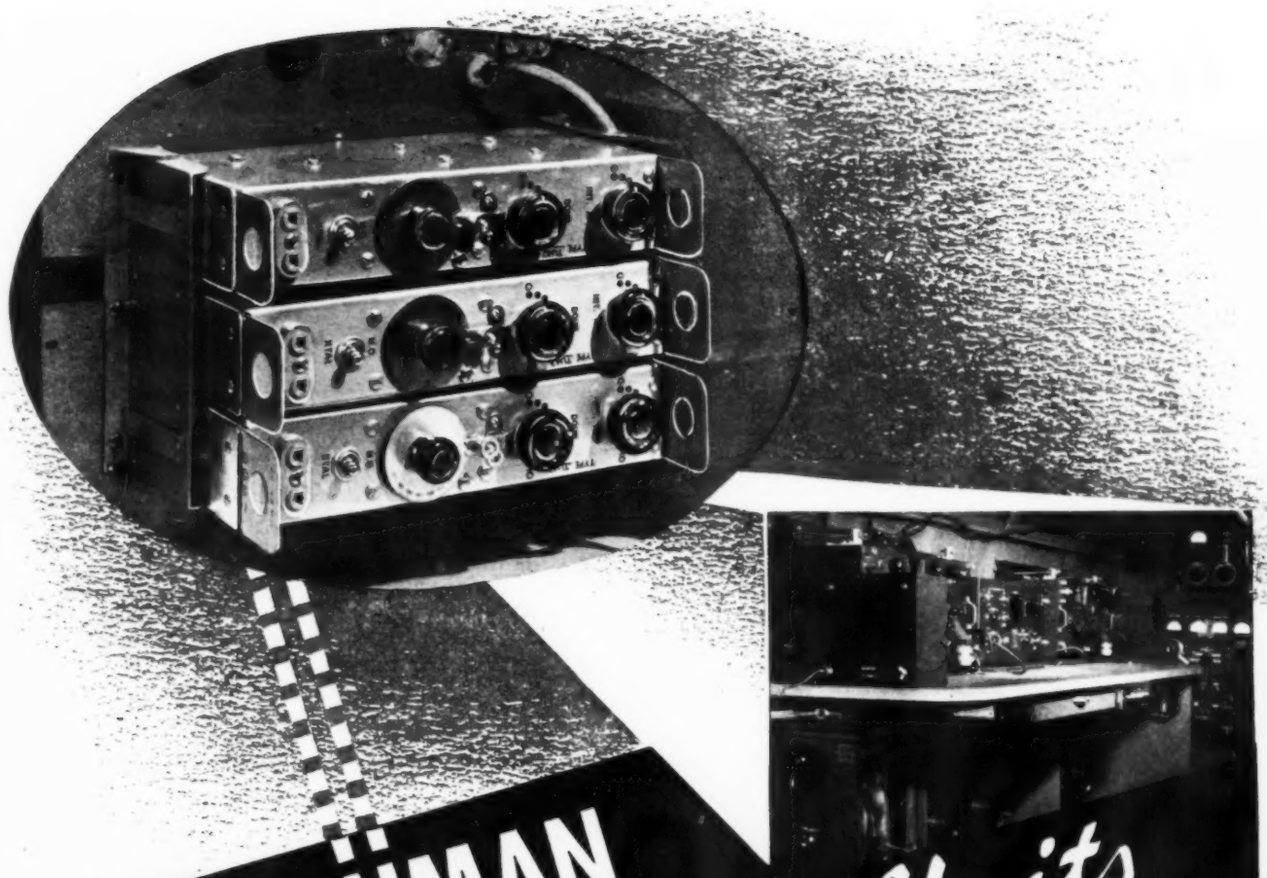
1⅛ INCHES WIDE
2¾ INCHES LONG
1½ INCHES HIGH
WEIGHT — 7 OUNCES
SINGLE OR DOUBLE POLE
WOUND TO SPECIFICATIONS

INQUIRIES INVITED



H. C. EVANS & CO.

1520-30 W. Adams
Chicago 7, Illinois



GUTHMAN *Super Tuning Units*

IN HALLICRAFTERS' SCR-299

We at Edwin I. Guthman & Company are proud of the Super Tuning Units that we manufactured completely in our splendidly equipped plant for the Famous Hallicrafters'-built SCR-299 mobile transmitter. Operating under most trying combat conditions on all Allied Fronts, the SCR-299 has distinguished itself amongst America's most vital "weapons" . . . and always, the Guthman Super Tuning Units rendered dependable and accurate service.





EDWIN I. GUTHMAN & CO. INC.

15 SOUTH THROOP STREET · CHICAGO

PRECISION MANUFACTURERS AND ENGINEERS OF RADIO AND ELECTRICAL EQUIPMENT

As the Front Advances

COMMUNICATIONS BECOME MORE VITAL THAN EVER

FRANKLIN manufactured products are doing their full share in keeping important communications lines open . . . and in helping to extend them on and on. We are proud to be playing a role in the success of famous HALLICRAFTERS units, as well as of other strategic war equipment used by America and her Allies. Experience gained by these efforts will contribute to peacetime products characterized by the same high quality which has been associated with the Franklin name since 1929.



FRANKLIN FOR QUALITY

Manufacturers: Limited capacity available for additional production of electronic power supply and industrial transformers. Inquiries on your requirements will receive prompt attention; please send specifications when writing.

FRANKLIN TRANSFORMER MANUFACTURING CO.
67 22nd Avenue NE Minneapolis 13, Minnesota

ARMY E NAVY

SHURE MICROPHONES

The SCR-299 and other communication equipment, vital to the strategy of land, sea and air warfare, use microphones and headsets designed and manufactured by Shure Brothers, twice awarded for production excellence by the Army and Navy.

SHURE BROTHERS, 225 West Huron Street, Chicago, Ill.

Designers and Manufacturers of Microphones and Acoustic Devices

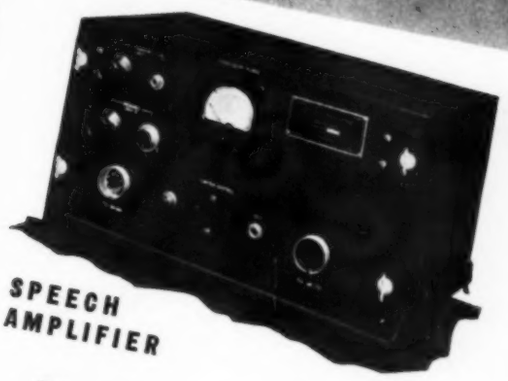
Faithful SERVICE

ON THE FIGHTING FRONT

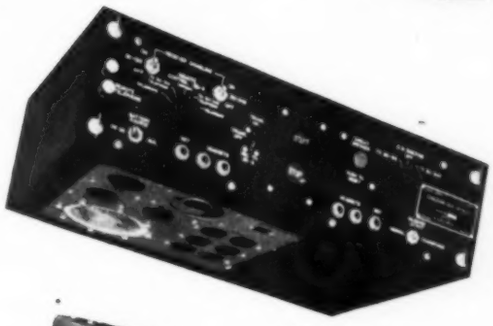
with hallicrafters built SCR-299

At The Radio Craftsmen we are proud of our role in the production of the key units illustrated here, each a vital part of the famous SCR-299 Mobile Communications unit.

Modern manufacturing ingenuity and skill combined with precision production methods here at The Radio Craftsmen are reflected in the faithful performance of this high-powered mobile communications truck on all fighting fronts.



SPEECH AMPLIFIER



JUNCTION BOX



TUNING UNIT



The RADIO CRAFTSMEN

1341 SOUTH MICHIGAN AVENUE . . . CHICAGO 5, ILLINOIS



LEUCK

CRYSTAL LABORATORY

245 SOUTH 11th STREET, LINCOLN 8, NEBRASKA

Is forging a vital link in the chain of Communications served by the

SCR-299

BUILT BY

hallicrafters

Plastic Parts . . .

MOLDED FOR HALLICRAFTERS BUILT SCR-299!

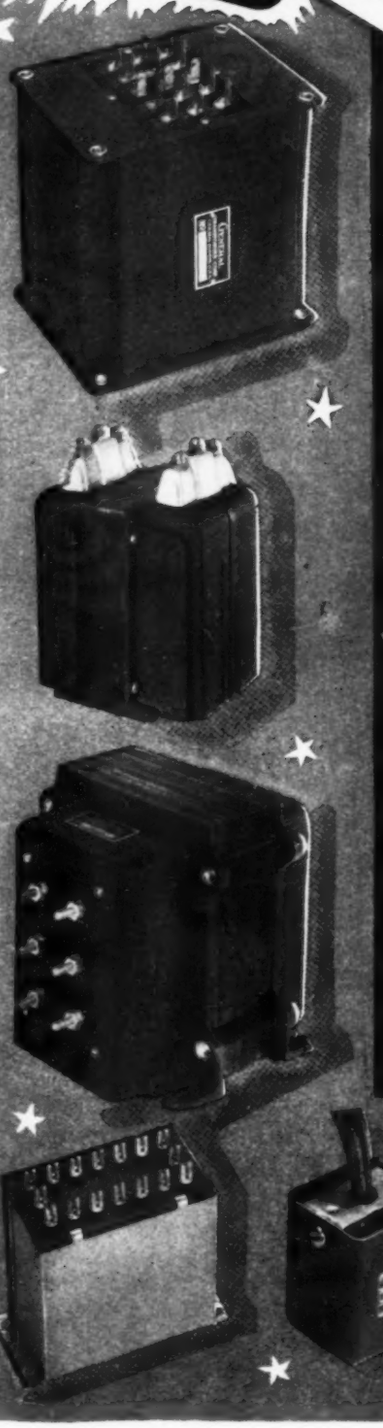
Molded Meter window escutcheons and control knobs are manufactured by Midwest for the famous SCR-299 high powered mobile transmitter, to withstand the rigors of modern warfare.



MIDWEST MOLDING & MFG. CO.

319 NORTH WHIPPLE, CHICAGO 12, ILLINOIS

IMPORTANT TO SCR-299 . . .



. . AND OTHER WAR COMMUNICATIONS AND ELECTRONIC EQUIPMENT . .

G.T.C. TRANSFORMERS
G.T.C. ASSEMBLIES

Including

POWER PACKS
SPEECH AMPLIFIERS
RECTIFIERS

BUILT TO THE RIGID SPECIFICATIONS OF THE SIGNAL CORPS; AIR CORPS; THE NAVY

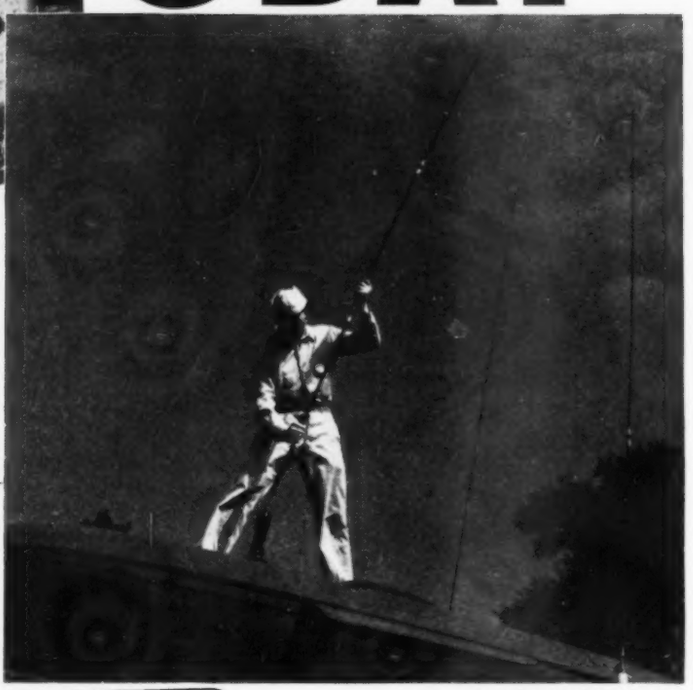
GENERAL
TRANSFORMER CORPORATION

1250 W. VAN BUREN ST., CHICAGO, ILL.



Yesterday... and TODAY





U. S. ARMY SIGNAL CORPS PHOTO

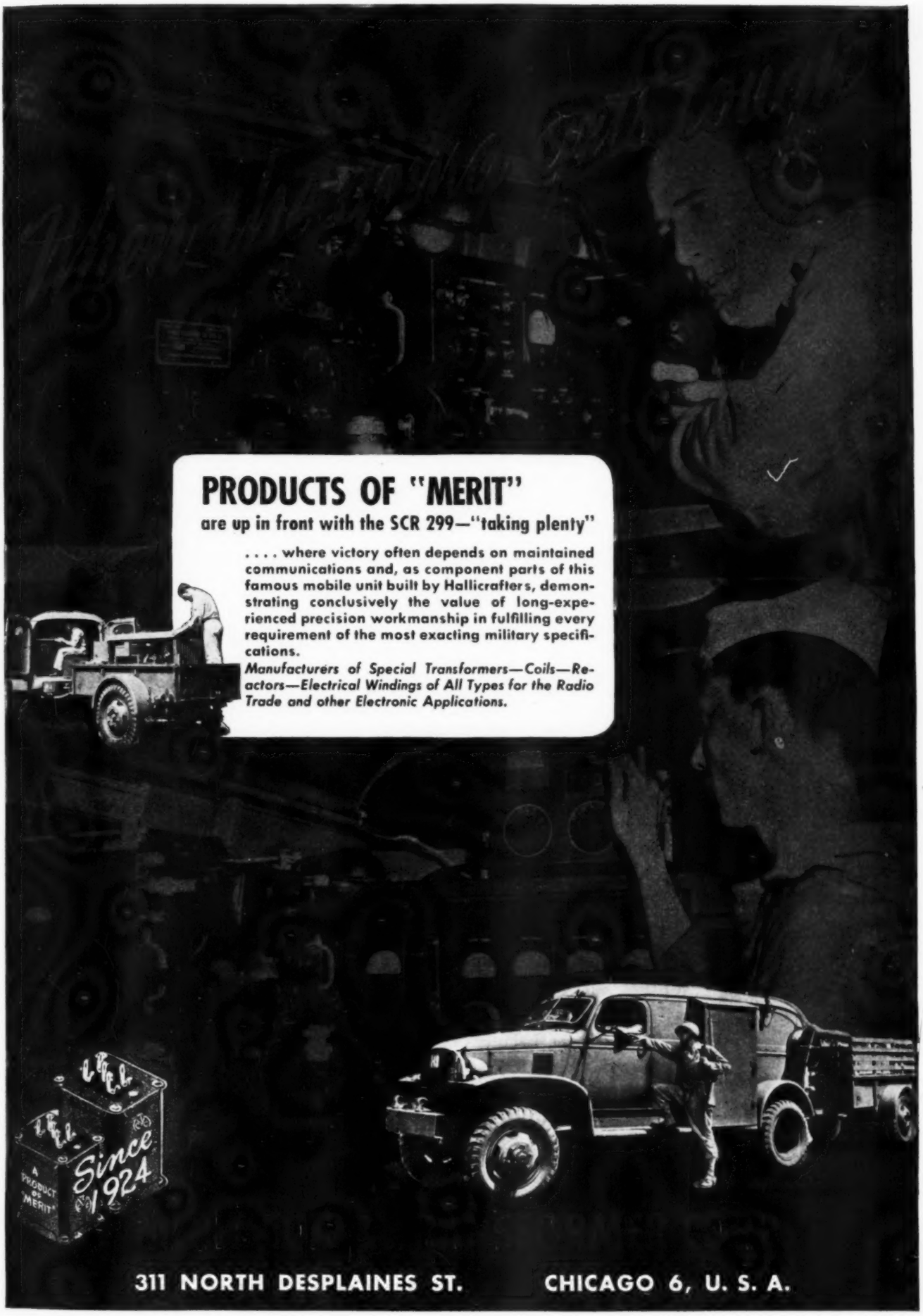


During Peacetime WARD PRODUCTS manufactured radio antennas for radio and automobile manufacturers . . . TODAY, in time of war, one of WARD'S operations is the manufacture of mast sections and mast-bases for the Hallicrafters-built SCR-299. The record of this communications truck is a great record, and its value to the victories already won and those being won is tremendous.

The **WARD PRODUCTS** CORPORATION

1523 EAST 45TH STREET, CLEVELAND, OHIO
CABLE ADDRESS: WARDPROD

PHONE HENDERSON 8315


PRODUCTS OF "MERIT"
are up in front with the SCR 299—"taking plenty"
. . . . where victory often depends on maintained communications and, as component parts of this famous mobile unit built by Hallicrafters, demonstrating conclusively the value of long-experienced precision workmanship in fulfilling every requirement of the most exacting military specifications.
Manufacturers of Special Transformers—Coils—Reactors—Electrical Windings of All Types for the Radio Trade and other Electronic Applications.
A PRODUCT of "MERIT"
Since 1924
311 NORTH DESPLAINES ST.
CHICAGO 6, U. S. A.





Type FSR-110—Complete information and specifications on request.

Federal congratulates The Hallicrafters Company for building the SCR-299, high-powered, Mobile Radio Communications Unit now serving the U.S. Signal Corps in all parts of the world.

Federal battery chargers, powered by I. T. & T. Selenium Rectifiers, are well known to men in all branches of the armed forces. Industry can obtain the same dependability and trouble-free performance from standard units now in production.

An example is the type FSR-110 — a rugged, portable unit for charging either 3 or 6 cell batteries or for use as a direct current power supply. The built-in features and specifications are those usually found only in individually engineered equipment. Its flexibility of output and its adaptability make this unit widely serviceable.

Consulting engineering service on the Federal line is available from Department L.

Federal Telephone and Radio Corporation

SELENIUM RECTIFIER DIVISION

AN IT&T ASSOCIATE

1000 Passaic Ave.
East Newark, New Jersey

WE CONGRATULATE THE HALLICRAFTERS WHO ARE JUSTLY PROUD OF THE WONDERFUL PERFORMANCE OF THEIR SCR 299!



OFFICIAL U.S. NAVY PHOTO

American, TOO, SHARES IN THIS PRIDE

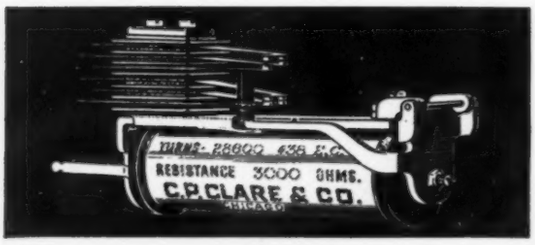
American equipment is incorporated in the Hallicrafters-built SCR-299. We are continuing with our standard line, which is also being used by the Armed Forces as illustrated by the above photograph of our D7TP in action.

Other SIGNAL CORPS models *American* is proudly producing for our Armed forces are the TS 11, the TS 13, the TS 15 and the T 24.

CATALOG ON REQUEST

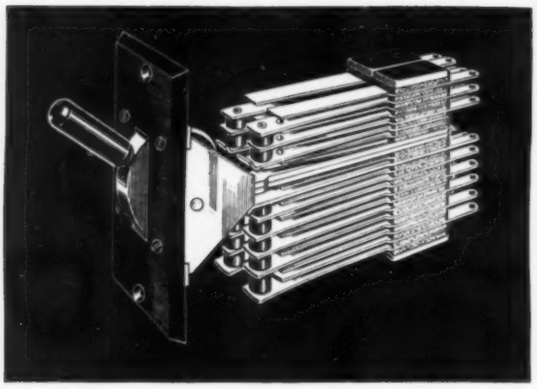
American MICROPHONE Co., Ltd.

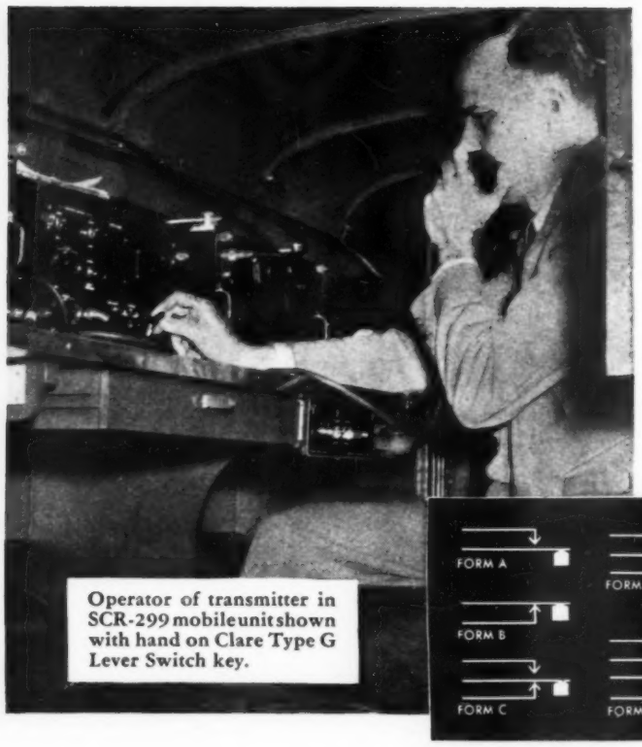
1915 SOUTH WESTERN AVENUE • LOS ANGELES (7), CALIFORNIA



(*Above*) Clare Type "C" Relay.

(*Below*) Clare Type "G" Lever Switch with Bakelite escutcheon and lever key handle of catalin.





Operator of transmitter in SCR-299 mobile unit shown with hand on Clare Type G Lever Switch key.

Spring assemblies may include any combination of the five basic forms illustrated.

CLARE Relays and Lever Switches Are Vital Parts of Army's Front Line Radios

RUGGED design of Clare Type "C" Relays and Clare Type "G" Lever Switches made them natural components of the Hallicrafter's 450 Watt Transmitter with which the Signal Corps maintains communications in battle areas. Their small, compact size and innumerable contact arrangements allow them to fit snugly into the space-saving designs called for in the SCR-299 mobile intercommunication unit.

The Clare Type "C" Relay is a multiple contact relay particularly adapted for use in radio communication—as well as in electronic control devices, sequence control or interlocking operations.

The Clare Type "G" Lever Switch offers the same versatility of contact arrangements. The cam assembly is unique in that stops may be provided, added or removed to change the switch from locking to non-locking, or vice versa . . . from one-way to two-way or the reverse.

These features, plus the fact that all Clare Relays and Lever Switches are carefully designed, well manufactured from the best available materials, and precisely adjusted, assure you that Clare products will reduce your overall relay cost, simplify your designing problem and assure better and more dependable performance.

Clare engineers are ready at all times to assist in developing a relay specifically "custom-built" to meet your requirements. Send us a "blueprint" of your problem for our suggestions. Also, send for the Clare catalog and data book. C. P. Clare & Company, 4719 West Sunnyside Ave., Chicago (30), Illinois.



Contacts can be provided in twelve different standard—or special—types and sizes. These are welded to the nickel silver springs by a special process. Contacts are made from precious metals or alloys, such as silver, palladium, palladium-iridium, tungsten and elkonium. Sizes may be from .062" silver, rated at 1 ampere, 50 watts, to .1875" tungsten, rated at 4 amperes, 500 watts. Various types can be incorporated in one assembly.



Spring bushing insulators are made of Bakelite rod under a patented process. These strong, hard, long wearing bushings are essential where heavy contact pressures are employed, where vibration exists or heavy duty service is desired.

CLARE RELAYS

"Custom-Built" Multiple Contact Relays for Electrical, Electronic and Industrial Use

BY DIRECT WIRE FROM

WESTERN UNION

1823

SYMBOLS
DL = Day Letter
NT = Overnight Telegram
LC = Deferred Cable
NLT = Cable Night Letter
Ship Radiogram

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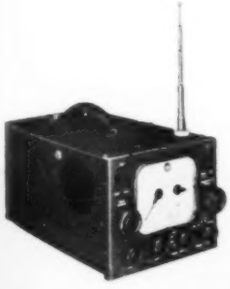
CLASS OF SERVICE
This is a full-rate Telegram or Cable-gram unless its de-ferred character is in-dicated by a suitable symbol above or pre-ceding the address.

The filing time shown is the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

#UP167 GOVT LG=CT WASHINGTON DC NOV 3 1943 251P
TO THE MEN AND WOMEN OF HALLICRAFTER CO INC=

:YOUR SX28 RECEIVER ON THE "USSS ENTERPRISE" RECEIVED CONSTANT
USE DURING THIS FAMOUS CARRIERS EXTENSIVE ACTIONS AGAINST THE
JAPS IN THE SOUTH PACIFIC, TUNED TO RECEIVE MESSAGES FROM HER
PLANES ON MISSION AND FROM FIGHTER PLANES PATROLLING THE FLEET
YOUR RECEIVER EFFICIENTLY KEPT THE "ENTERPRISE"INFORMED OF THEIR
ACTIVITIES, THIS INFORMATION WAS USUALLY TRANSLATED INTO ACTION
AGAINST THE JAPS - TO THEIR SUBSEQUENT SORROW AS THE
"ENTERPRISES" RECORD OF 185 PLANES DESTROYED 27 SHIPS SUNK AND
16 DAMAGED WILL ATTEST:

:E L COCHRANE
REAR ADMIRAL USN
CHIEF OF THE BUREAU OF SHIPS,









These
hallicrafters
Receivers Went to War!

THE amateur fraternity is proud that Hallicrafters equipment—*built to amateur requirements*—meets the exacting wartime qualifications and demands of military service in each United Nation. The Hallicrafters label has become an old friend to fighting men on land and sea, on all the world battle fronts.





HALLICRAFTERS WAS READY!

Under the abnormal climatic and operating conditions of war, the Signal Corps SCR-299 communications truck, built by Hallicrafters, is providing peak performance for the Allied armed forces, fighting throughout the world.

Hallicrafters peacetime communications equipment is meeting the wartime qualifications and demands of the Military!

Just as Hallicrafters Communications receivers are meeting the demands of war Today—they shall again deliver outstanding reception for the Peace—Tomorrow!

hallicrafters BUY MORE BONDS

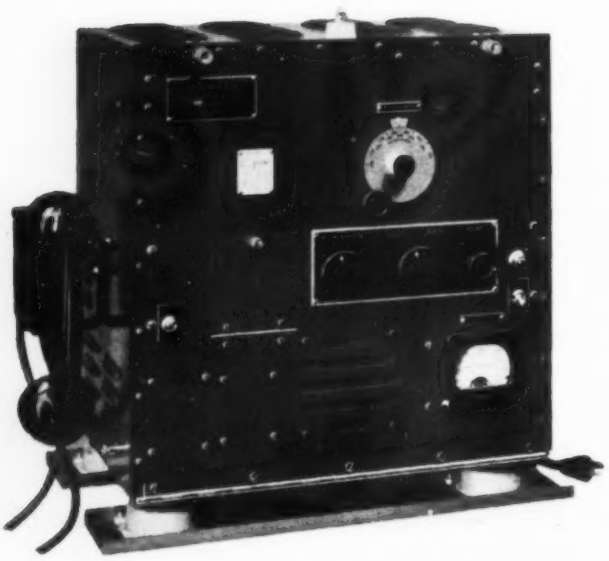
World's largest exclusive manufacturer of short wave radio communications equipment...First exclusive radio manufacturer to win the Army-Navy Production Award for the third time.



COMPACT MOBILE RADIOTELEPHONE

SCR-543 is a low-powered transmitting and receiving unit being built by Hallicrafters. When mounted in a scout car it dashes virtually into the jaws of the enemy to direct artillery fire and carry out similar communications duties. Designed and built to be operated by combat soldiers as easily as by highly-trained radio personnel.





MARINE-TYPE RADIOTELEPHONE

SCR-281 — *another* Hallicrafters-built unit has gone to war! This radiotelephone installed in coastal and harbor vessels is performing vital ship-to-ship and ship-to-shore war duties. Because of its extreme simplicity it can be operated by even the most inexperienced personnel . . . *just as easily as an everyday telephone!*



BUY MORE BONDS!

hallicrafters

WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF SHORT WAVE RADIO COMMUNICATIONS EQUIPMENT

Engineering Library
Direct
6-14-45
Shortage (v.31, no. 2)



William B. Ziff

Foreword

MODERN war is a tremendous and complex business. In a phenomenon of such power and pyrotechnic display we are apt to lose sight of the vast, smooth-working machine by which it is efficiently waged.

It is axiomatic that the struggling soldier loses sight of the battle in the excitement of individual combat; the craftsman is apt to see only the condensers he is assembling rather than the huge installations for which they are intended. So do all of us have difficulty in grasping the immense shape of the total war-making machine of which we are a part. It is the old story of the three blind men and the elephant. The one who felt the trunk described it as an animal built like a tree; the one who patted its side thought of it as built like a door; and the one who grabbed the tail said it resembled a snake.

It could hardly be otherwise. With its unending complexity of detail the complete canvas of World War II is too enormous for the range of human vision. Even a single major segment of the picture such as the U. S. Army Signal Corps, appears in proportions so huge as to practically defy comprehension.

Today, entering the third year of the deadliest war in history, the Signal Corps has grown to an amazing institution, a living testimonial to the genius and know-how of the greatest industrial people on earth.

Behind this prosaic simple name, Signal Corps, is everything which goes to make industrial achievement, courage, determination, organization, and the will to win.

The Signal Corps is all of these things: It is a sweating soldier pounding a radio key in a truck jogging over bomb pits or careening crazily under the concussion of shells. It is a cripple grinding crystals, and a woman at a drafting board, or a kid winding motor armatures. It is all of these multiplied by a thousand times and augmented by many thousands more.

It is smoking, deadly combat, and throbbing industry; it is the thick of the fighting in every theater of action; it is farmers, miners and workers; it is the very essence of big business; all coordinated under the symbol of the torch and crossed signal flags.

Thus it is that to conceive the Army Signal Corps as it actually exists—the biggest communications industry of all time, purchaser of billions of dollars worth of equipment, and ruler of a complex radio, telephone and telegraph network spread like a giant web over the entire face of the globe—taxes the imagination.

It is doubtful whether the Chief Signal Officer himself, though his guiding fingers touch every activity of the Corps, can ever pause amidst its incessant demands to realize the extent of his charge.

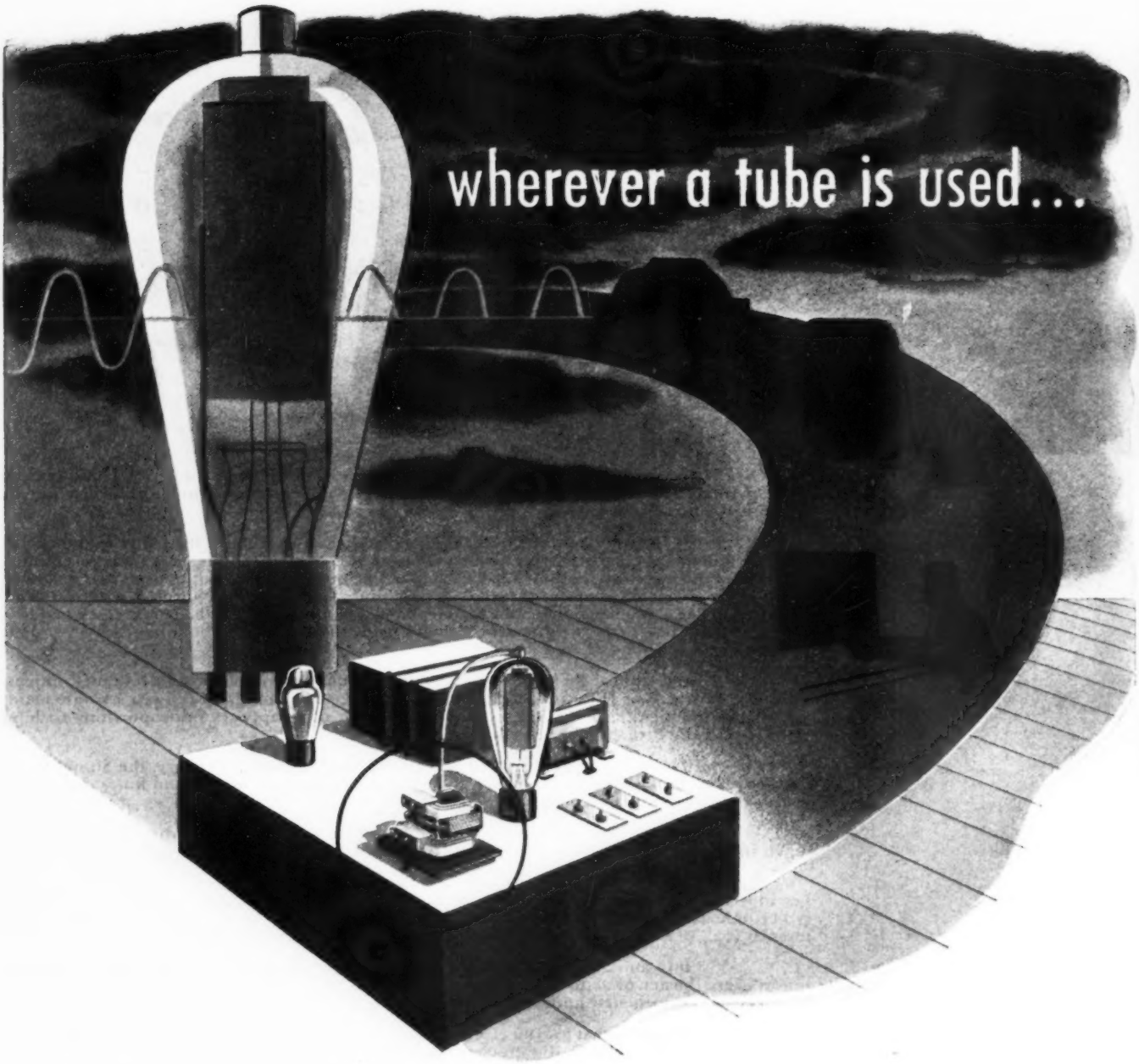
In the pages which follow is given the story of the Army Signal Corps at War, as it exists today. For those myriads of workers, executives and administrators who function in relation to this great institution, it fills an important need. It enables them to visualize the great changes which have taken place in its powerful, smoothly-moving organization. They see, in this graphic though matter-of-fact account, the vital relation of the Signal Corps to the total war machine, its heroic accomplishments in combat, as well as its scientific wizardry and industrial magnitude

In presenting the story of the Army Signal Corps at War, we do so with the warm pride and reverence of Americans who are privileged to see a preview of one of this country's greatest institutions.

To General H. C. Ingles, to Colonel C. J. McIntyre, and to the other officers and enlisted men of the Army Signal Corps whose generous cooperation has made this report to the nation possible, we make grateful acknowledgement.

William B. Ziff

Publisher, RADIO NEWS

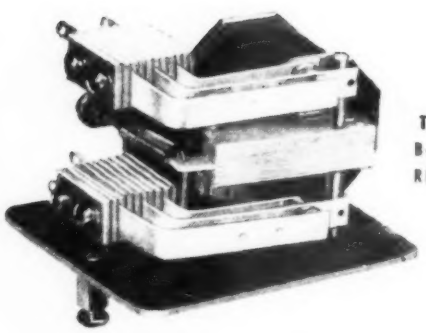


THERE'S A JOB FOR

Relays BY GUARDIAN

★ Wherever the rectifier type of tube is used, generally there's a job for a relay . . . a RELAY by GUARDIAN . . . in secondary and/or primary circuits where double pole, double throw "on and off" switching is desirable.

Typical of such a relay is the Guardian Type B-100. This double pole, double throw relay is equipped with silver contact points having a capacity up to 1500 watts, 60 cycle non-inductive A C.; and in A.C. primary circuits of any inductive power supply delivering up to and including 1 Kw. Standard coils operate on 50-60 cycle A.C., 110 volts, consuming approximately 8½ VA. Coils available for other voltages. Write for Bulletin OF-112 showing standard relay types.



TYPE B-100 RELAY

Electronic rectification, long used to convert A.C. to D.C. power, is now coming into use to operate variable speed D.C. motors . . . battery chargers, etc. In such applications, the type B-100 relay shown above is often used.

GUARDIAN ELECTRIC

1630-P W. WALNUT STREET CHICAGO 12, ILLINOIS

A COMPLETE LINE OF RELAYS SERVING AMERICAN WAR INDUSTRY



Lt. Gen. Brehon Somervell

Introduction

FORCES of the United Nations in recent months have won encouraging victories, but not Victory.

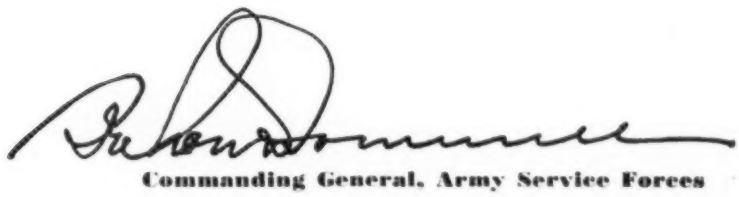
Without the swift and accurate communications system provided by the Signal Corps of the Army, these successes could not have been achieved.

Lacking the endless stream of equipment pouring from our production lines, the Signal Corps could not have maintained these all-important lines of communication.

Victory lies ahead. So does the hardest fighting. So, too, does the most stupendous demand ever made upon the resources of this or any other nation.

Utilizing the product of the untiring effort of the communications industry, the Signal Corps will never fail to "get the message through."

Such teamwork between our fighting forces and the free enterprise and free labor of a free people will hasten the day when our victories will be consummated with Victory.



Commanding General, Army Service Forces



Oliver Read

Presenting–

The Chief Signal Officer:

Maj. Gen. HARRY C. INGLES

TO MEET the primary responsibility of the Signal Corps of the Army Service Forces, as the major communications agency for the Army, for military Signal communications; to develop, procure, store, issue, and repair that equipment and supplies in such quantities and at such times as are required to meet the Army supply program and to install and operate much of this equipment—is the mission of Major General Harry C. Ingles, Chief Signal Officer.

Born on a Nebraska farm, March 12, 1888, and educated in country schools, Harry Ingles attended the University of Nebraska, Electrical Engineering, 1906-1909; entered United States Military Academy, West Point, 1910, graduating with B.S. degree in 1914; commissioned 2nd Lieutenant of Infantry, June, 1914; served at various stations with the 14th Infantry along the Mexican Border until May, 1917; detailed in the Signal Corps in July, 1917, serving for several months with the 2nd Telegraph Battalion; transferred to assignment as instructor in Signal Corps Officers' Training Camp, July, 1917. Later placed in charge of Signal Officers training and spent the remainder of World War I in charge of training of Signal Corps Officer Candidates. After World War I served on various Signal Corps assignments including command of Signal Corps ROTC unit, University of Minnesota; Signal Officer, Philippine Division; Director of the Signal Corps School; Instructor in Signal Communication, Command and General Staff School; Command of 51st Signal Battalion; Signal Officer, Third Army; and Signal Officer, Caribbean Defense Command. Served on the War Department General Staff, 1935-1939. Promoted from Lieutenant Colonel to Brigadier General, April, 1941. Chief of Staff, Caribbean Defense Command, March, 1942-January, 1943. Promoted to Major General, December, 1942. Commanded the Mobile Forces in Panama. Deputy Commander, European Theater of Operations, from the late winter to late spring of 1943. General Ingles was made Chief Signal Officer July 1, 1943. Military education: Graduate Signal Corps School, 1920. Distinguished Graduate, Command and General Staff School, 1927. Graduate Army War College, 1932. General Ingles is a member of the Beta Theta Pi fraternity. He married Grace Murray Salisbury of Lincoln, Nebraska, December, 1914. They have three children—Martha, now married to Major John R. Schrader; Mary, now working with the American Red Cross; and John, now in the Army.

It is a genuine privilege to present our Chief Signal Officer to the thousands of readers of this important issue. It has been my good fortune to have spent many hours with him, learning of the many problems encountered by his office and observing the efficient manner with which he and his command are solving those problems. He has the deepest admiration for those who are bending their efforts to hasten the day of Victory. Brilliant and modest—beloved by both his men and the business men with whom he works—General Ingles has won our deepest respect. He is "getting the job done"!

Oliver Read

Managing Editor, RADIO NEWS



Maj. Gen. Harry C. Ingles

A MESSAGE

From the Chief Signal Officer

ON BEHALF of all military members of the Signal Corps I take this opportunity to thank all civilians, whether employed in the Signal Corps or in the plants throughout the country where signal equipment is manufactured, for their splendid aid in helping to supply our Army with the world's finest in military communications equipment. Whatever successes have been achieved by our hard-fighting soldiers in every branch of the service, were due to their faith in the civilian workers on the home front, and the knowledge that through your efforts they would be furnished the necessary implements of war.

Your work here at home—whether it is supervisory, technical; on the production line, or clerical—plays an important part in the successful prosecution of a campaign. In battle, our combat forces are able to advance because of the coordinated action of all units involved. This coordination is made possible through the use of signal equipment—electronic, telephone, and telegraph—which civilians build. The Signal Corps supplies this equipment to the units of our Army now fighting in every quarter of the globe.

Our fighting men will win this war for us if we give them the equipment. Front line soldiers depend on you to discharge this trust. You have done a magnificent job thus far, but there must be no letdown in your efforts. Victory can be hastened by your continued support. I am confident that you will do your best for the finest fighting force in the world—the United States Army!

H. C. Ingles

Chief Signal Officer, U. S. Army

☆ ORGANIZATION ☆

Without a smoothly-working organization, the Signal Corps could not function at its present highly-effective pace.

Major Gen. JAMES A. CODE, Jr.



Born in California in 1893. Graduated from the U. S. Military Academy in 1917. First service was with the Artillery, as Major (temporary) in 1918, reverting to permanent rank of Captain in 1920. Promoted to Major in 1932; to Lieut. Col. in 1940; Colonel in 1941; Brig. General, 1942; and at present is Major General. Transferred to the Signal Corps in 1923, has held numerous posts, including duty at Manila, and in the Panama Canal Zone. Assigned to the Office of the Chief Signal Officer in 1941. In July, 1942 he became Assistant Chief Signal Officer.

NEVER in the history of man has there existed a communications responsibility of the size and magnitude which confronts the Signal Corps today. Just like the coursing of blood through our veins, the work of the Signal Corps in war is unending until final peace.

To accomplish its mission and to effectively provide the stewardship necessary to assure thrift, economy, and efficiency of performance with Public Funds, organization is necessary. A plan of organization is essential to harness individual energy to a team; to facilitate and expedite the direction, coordination and control of an enterprise, for it is the machine upon which management progresses. The organization plan of the Signal Corps has several simple objectives:

a. To provide that every function included in the mission is assigned to a unit of the organization.

b. That each unit's responsibility is specific and not duplicated.

c. That commensurate authority is coupled with responsibility.

d. That channels of command are definite and unbroken.

e. That staff and command responsibility are understood and not violated.

f. That the entire endeavor is logically subdivided into its inseparable components.

g. That the delegation of authority and decision is decentralized to the lowest practical operating level.

h. That provision is made for proper policy determinations, long-range planning, and over-all control.

i. That organizational structures, systems, and procedures do not become elaborate.

It was particularly fortunate that the Signal Corps organization did not "evolve" under changes and additions to meet expediency, but was permitted by the bomb bursting of war to be erected as a cohesive, organizational structure along one architectural basis devoid of a conglomeration of outworn assemblages.

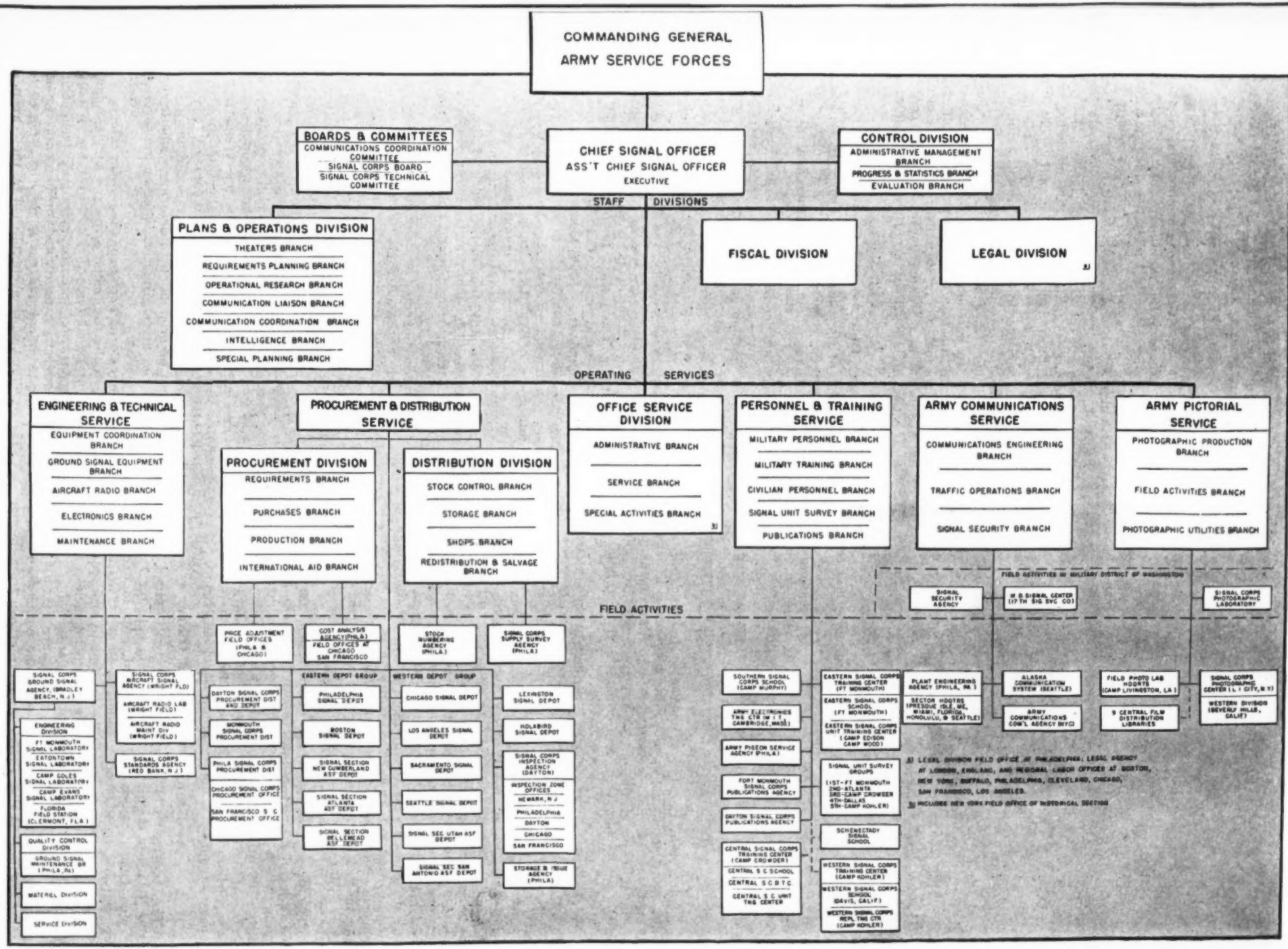
Signal communications have not only kept pace with modern war, they have leaped ahead at a speed of light. That fact alone requires an organization receptive to the lessons of the past for use of the present and one ever alive to the requirements of the future.

To meet the problem demands aggressive leadership, planning and direction in an unbroken chain from the top down; initiative and pressure consistently and wisely applied to eliminate unnecessary functions, activities, personnel, or layering. It consists of devising a working mass where each is busy, knowing his job and to whom he reports. It requires the recognition of good work. the realization of interest, and confidence by superiors. While the chain of command must start at the top and the policies must so conform and run through the entire structure that delegation of authority will be alway unequivocal and complete, nothing must prevent the presentation of suggestions. There can be no substitute for individual initiative, resourcefulness, and energy to get the job done.

Civil Service employees working in a government secretarial office, Washington, D. C.



Organization Chart of the U. S. Army Signal Corps





Veteran of World War I and wife brush up on their code.

While management must be ahead of its organization and provide personal aggressive leadership, a chain is ineffective when it becomes isolated links. It is for that reason that the whole, while remaining flexible, must be welded into one smooth operational function looking upward for instruction and guidance to rivet together a machine for perfect precision and a unified marriage of efforts.

Organization is often a misinterpreted and misunderstood word and is not synonymous with chart or drawing. It means "that which is organized," which means men; men who can devise as well as procure; men who can train as well as use; men who maintain as well as repair; men who combine vision with drive.

Organization is the channel through which the activities of such men flow. It is the reins which direct this energy toward a concrete dynamic result. The mission of the Office of the Chief Signal Officer is to provide the channels by which command may command. Organization is the means to accomplish this mission. Yet an organization is really in existence only when all of those to be affected understand it. It must be as familiar to the outsider who has dealings with it as it is to its members. All must know whom to contact and the relationships between organizational members. The simplest way to do this is to document the plan of procedure; but think of organization not as a paper plan but as the written disclosure of a beehive of coordinated human energy, all acting toward the accomplishment of a common objective.

Signal Corps

The present Signal Corps organization consists of the Office of the Chief Signal Officer in Washington, D. C. from which staff supervision is exercised over all the activities and functions of the Corps; the office comprises an Assistant Chief Signal Officer; a Control Division; several boards and committees; three staff divisions; five operating services, and an Office Service Division.

Assistant Chief Signal Officer

The Assistant Chief Signal Officer represents the Chief Signal Officer during his absence. He acts for the Chief Signal Officer as his principal coordinator in a capacity comparable to that of a Chief of Staff. The Assistant Chief Signal Officer directs the continuous study of anticipated future developments, and contingencies, and the preparation of over-all operating plans.

He is assisted by executives who insure that all instructions published are in accord with the policies and plans of the Chief Signal Officer and directives from higher authority. It is within this office that assignments and reassigments of officers to duty in Services, Divisions and Branches of the Office of the Chief Signal Officer, and to committees, boards, and other duty are made.

Control Division

Directly responsible to the Chief Signal Officer is the Control Division. This agency studies and evaluates the functions, organization, administration, methods, procedures, and operations of all activities under control of the Chief Signal Officer, both within his office and in the field.

Although Control Divisions were subsequently established in all supply services in accordance with the example and wishes of the Commanding General, Army Service Forces, the first organization of this character known to exist was established by the Chief Signal Officer in the late summer of 1941, as the Executive Control Division.

The Control Division assists in planning and developing the organization structure to cope with the increasing responsibilities. It reviews and audits all reports of the organization to be submitted to the Chief Signal Officer and higher authority. It makes extensive examinations of basic reports and record systems, and assists in effecting improvements in statistical methods, better coordination of records, and improved accuracy and completeness of reports.

Boards and Committees

The Office of the Chief Signal Officer in Washington is assisted in its myriad problems by a number of boards and committees, which serve in the capacity of advisory agencies to the Chief Signal Officer.

As the occasion demands, new boards or committees are organized to investigate and report on some particular situation or problem affecting development, production, delivery, price, or performance of Signal Corp equipment. Other boards are organized in the interest of personnel, both military and civilian, or for matters of policy or security.

Frequently these agencies are abolished as soon as their aims are accomplished, or the duties and functions may be reassigned to existing agencies within the office for continuing action. Today three important agencies remain in force: The Communication Coordination Committee, Signal Corps Board, and Signal Corps Technical Committee.

The Communication Coordination Committee assists and makes recommendations to the Chief Signal Officer in the establishment of War Department policies on operational methods and equipment for communications for the Army. The committee consists of a representative and an assistant who devote full time to the work of the Committee from Operations Division, War Department General Staff; Army Air Forces; Army Ground Forces; and Army Service Forces.

All matters connected with communications arising in the Army Air Forces, Army Ground Forces, or the Army Service Forces, which affect two or more of these forces, are referred to this committee. Divisions of the War Department General Staff also use its services on matters requiring coordination in communication matters, either within the United States, or as may arise in overseas theaters of operation requiring coordination between theaters or between theaters and the United States.

The Signal Corps Board has been in existence since 1924. Its function is to initiate and submit recommendations for the improvement of Signal Corps operations and equipment. The Board, appointed by the Chief Signal Officer, is located at Fort Monmouth, New Jersey. It is here that tests are conducted on commercial equipment or during development or production to determine whether military characteristics are satisfied or whether improvements are required.

The Signal Corps Technical Committee effects coordination between the interested arms and services during the development and standardization of types of equipment and the preparation and coordination of specifications. It acts in an advisory capacity and considers and reports upon such other technical matters as may be referred to it.

The excellent work accomplished by these agencies con-

tributed in no small measure to the success of our troops and those of our allies in all theaters of operation during the past year.

Staff Divisions

The Staff Divisions are Plans and Operations, Fiscal and Legal.

The Plans & Operations Division handles all matters pertaining to planning and coordination necessary for strategical and tactical matters. It performs staff functions relating to communications policies, procedures, tactical doctrines, and techniques. One of its accomplishments was concerned with the details of the complex communications required for the simultaneous landings at Casablanca, Oran and Algiers. This entailed the furnishing of hundreds of Signal Corps troops and thousands of tons of Signal Corps equipment.

The Fiscal Division is responsible for all the funds appropriated to the Signal Corps in its function of providing our Army with the world's finest military communications equipment. For the Fiscal Year 1943-1944, these appropriations amount to five billion dollars.

When it is recalled that in World War I, for the two-year period from April 1917 to April 1919, the Signal Corps spent the then unheard-of amount of $128,920,000 for war material, today's appropriations for the Corps can safely be said to be staggering.

The Legal Division is the agency which acts as general counsel to the Chief Signal Officer on all legal matters. It reviews all pending legislation affecting activities of the Chief Signal Officer and takes action in connection with patents, copyrights, inventions, and licenses. If there is doubt on any legal point the question is referred to the Judge Advocate General or to the legal units of the Army Service Forces or to the Under Secretary of War.

This Division reviews all formal contracts and all informal contracts in excess of $50,000 to determine if they are in accord with law, regulations, and directives. It represents the Chief Signal Officer in matters related to labor relations, labor morale, and supply of labor as they affect Signal Corps contracts, maintaining regional labor offices in seven major cities in the United States.

Operating Services

There are five operating services in the Signal Corps organization.

The Engineering & Technical Service directs research and development of Signal Corps equipment for all Branches of the Army—ground and air. It provides expert consultant service and loans technical personnel to other operating services.

To provide its research activities with the broadest possible base, it is the policy of the Signal Corps to utilize to the utmost the research facilities of private industry and academic institutions. The Signal Corps laboratories, however, maintain a development and design staff, which supervises development work done for the Signal Corps by industrial concerns.

Through the efforts of this Service, frequency modulation has been applied to signal radio equipment; reception interference by static and battle noise has been reduced, and mobile radio stations of medium ranges were successfully developed.

An efficient piece of equipment produced through this Service is the 5-pound "handie-talkie" radio set known as the SCR-536. This tiny transceiver, light enough to hold in one hand, is a favorite of Infantry patrols and other front-line troops. They are in use in all theaters of operation from Italy to the jungles of the Southwest Pacific.

The Procurement & Distribution Service consists of three divisions, one of which is temporary.

The Procurement Division arranges for the purchase of every type of Army communications equipment, including radio, telephone, telegraph, and teletypewriter. It takes appropriate action to achieve production and delivery of, inspects and accepts such equipment and supplies. During the past year this Division placed orders with industry for more than three billion dollars worth of communications equipment.



Operator copies 60 words per minute from Boehme teletype tape.

To meet the offensive now in progress by the United Nations, a Distribution Division was organized. This division exercises staff supervision over all Signal Corps Depots located strategically throughout the United States. These depots store and issue signal equipment to hundreds of posts, camps, and stations in this country and to our combat organizations wherever they are located in theaters of operation. The Division also salvages and repairs all such material, except photographic and fixed communications equipment.

The third Division in this service, the Requirements Division, is temporary at this writing. It compiles and prepares requirements for Signal Corps equipment and supplies for approval by Headquarters, Army Service Forces, which are published in the Army Supply Program. It reviews, edits and correlates requirements submitted by all using agencies and computes required production for Signal Corp equipment. The division maintains current data on costs of equipment and supplies and prepares budget estimates for Signal Corps procurement funds.

The Personnel & Training Service consists of four Branches: Military Personnel Branch, which handles all administrative matters for military personnel; Military Training Branch, in charge of training activities; Civilian Personnel Branch, which is responsible for the procurement, training, and assignments of all civilian employees in the Signal Corps; and the Signal Unit Survey Branch, the training inspection agency for the Signal Corps, which

(*Continued on page* 440)



Signal Corps warehouse at Casablanca, North Africa, where large stores of equipment are held in reserve.

PROCUREMENT

Huge warehouses are set up near every war theater to store vast quantities of Signal Corps equipment and accessories.

IF, AS General Nathan Bedford Forrest said, "victory is a matter of "gittin' there fustest with the mostest," then half the job of winning the war depends on procurement. Because procurement is the task of "gittin' the mostest."

Stated in those terms it appears quite simple. Superimposed on the pattern of modern warfare, however, procurement is a complex design of far-reaching activities.

Signal Corps procurement is a wide range of knowledge of techniques, of materiels, of manufacturing processes, of equipment, transportation, metallurgy, electronics, mechanics, chemistry, finance, economics, law, and logistics.

Obviously, Signal Corps procurement can be no one man. To be successful, it must be a huge and smooth-running organization of all those highly specialized services, and many more, operating to shape the communications materiels of war and draw them together for effective use.

The organization must be capable of more than filling the order; it must be able to anticipate the order. For example, an operation is planned. Naturally, there will be a great drain on communications equipment. But that knowledge in itself is not sufficient. Is it to eventuate into a campaign of swift and penetrating mobile movement, or of stabilized, siege-like strategy? On the answer to that question depends the planning of the whole signal procurement program.

Placing the orders is an all important part in the long process of preparation and the task of getting the equipment out on time.

Long before orders can be filled, the problems of basic materiel shortages must be met. One of the biggest jobs the Signal Corps Procurement Division has, is in this field. Shortages, which at one time appeared most critical, included mica for capacitators, sapphire jewels for meter bearings, tantalum for high-frequency electronic tubes, and acetylene black for batteries.

The mica capacitor constitutes one of the most important individual radio component parts applicable to the radio industry. Before the war it was designed into all important radio equipment. Then most of our mica came from India, but imports from India today are not the simple matter that they were then, so steps had to be taken to develop sources near home. Mines are being exploited in Brazil, Mexico, and Argentina as well as the United States. But in addition to that, substitutes were found effective in many cases and facilities were established for the manufacture of oil-filled paper and ceramic capacitors.

Glass-bead jewels have made satisfactory substitutes for sapphires, zirconium plated molybdenum, and graphite anodes have been substituted for tantalum in electronic tubes; the supply of acetylene black has been augmented by calcined carbon black; 83,000 pounds of copper were saved by substituting copper clad steel wire for copper wire; steel, zinc, and plastic replaced much aluminum.

In almost all cases, anticipating shortages has meant eliminating them.

Steatite is a good example. Steatite is manufactured from the steatite talc that forms a base for women's face powder. Its quality as a high-frequency insulation for radio communication equipment brought such a demand that steatite insulators soon represented a major bottleneck. The Army and Navy coordinated on a substitution program that utilized plastics and ceramics. But the Signal Corps had already instituted an industry-wide expansion of steatite manufacturers. As the demand for plastics increased because of their growing use in munitions, gas masks, airplane parts, and items of equipment for the individual soldier, factories were able to revert to steatite again with a good surplus from which to draw.

Shortages have turned up in strange places, such as, the lack of lithium hydride that threatened the Signal Corps development of Radio Set SCR-578, an emergency sea rescue transmitter for the Air Corps. The lithium hydride

was needed to generate hydrogen gas with which to inflate a balloon to raise the transmitter antenna. In peacetime there was little need for the stuff. So to get those radios out, the Signal Corps first had to expand production of lithium metal, then provide facilities for converting it to hydride.

At the other end of the procurement problem, is the job of getting the equipment out of the factory and on its way to the combat zone. That's an everyday, all-year-round job, but sometimes it becomes Herculean.

Such as, the case one day in 1943 when a cable from one of the theaters of operation ordered a 1,350 mile telephone pole line, complete to every crossarm and nail. Four hundred fifty miles of this equipment had to be ordered, priced, loaded and transported to a port of embarkation within ten days.

Special arrangements were made, with various Signal Corps Inspection Zones, to assure proper accountability and have Government Bills of Lading issued; arrangements were made with the Chief of Transportation for shipment by truck of 1,900 miles of wire from one manufacturer and 1,300,000 pounds of wire from another manufacturer. Release for freight car shipment of lumber and cross-arms on Government Bills of Lading and at least two to three reports daily on the location of these cars, became necessary. Some of the material had to be shipped from one coast to the other. Factories and individuals worked 72 to 96 hours without rest. But the deadline was met.

To be able to meet these emergency orders, and at the same time to keep up the smooth flow of equipment requires constant coordination with the Army Air Forces, Navy, Coast Guard, Marine Corps, the United Nations Missions, and many government departments whose demands are similar.

The drama of converting America's great peacetime industry into a war arsenal has had the Signal Corps as one of its prime directors. Since radio and other electronic equipment comprise 90 per cent of Signal Corps procurement, and since America already had a huge radio industry at the outbreak of the war, this may not appear to have been much of an order.

But there is a great difference between civilian and military requirements in radio equipment. In the first place, most civilian radio equipment is designed to sit in a safe and stable, protected place. Military radio is constantly on the move, banged and battered, subject to shock and stresses of explosives and manhandling, shaken and vibrated in tanks and trucks and airplanes, and exposed to extremes of heat and cold, dust and water. Military sets must be built to withstand all these things, which accounts for their greater cost, and what would ordinarily be slower production.

Then there is the subject of tubes. In peacetime, for each set of transmitter tubes sold, tens or hundreds of thousands of sets of receiving tubes were marketed. At the time of the invasion of Poland, 200 types of receiving tubes were being produced by American manufacturers. But today the Army alone uses more transmitter and special purpose tubes than former over-all production.

Things like that required conversion of the greatest part of the radio industry, while the multiplied demands called for expansion on an unheard-of scale. The expansion was accomplished by the industries themselves and through government financing.

In the first part of the War, Signal Corps sets, requiring high frequency antenna transmission lines, were using rigid lines, either air or nitrogen gas filled. But combat conditions found this type of transmission line frequently breaking down due to vibration, and too much time was required to set up or dismantle it. At that time, no one was manufacturing a truly flexible cable and only one firm produced a semi-flexible cable using polysterene beads inside a soft copper tube, or insulated braid. The Signal Corps helped the company to produce a flexible cable using a polyisobutelene dielectric. Because of the volume of Signal Corps orders, other companies soon followed the pioneer firm's lead, and the problem was met.

Two important devices in Army radio equipment are Selsyns and Amplidynes. Selsyns and Amplidynes are



Completely waterproofed handie-talkie—typical of the equipment that is shipped in large quantities throughout the world.

trade names, the first for a device for remote signalling, control, and indication; the second a power-control having a high amplification factor, rapid response, and extreme reliability. It is of more recent origin than the Selsyn, having been developed during the past three or four years. But at the start of the war, only one facility was producing these devices. An elevator factory was found with machine tool equipment and technical personnel adapted to Amplidyne manufacture, and production there was soon followed by others until now eight prime contractors and subcontractors are equipped to manufacture the devices.

During the Civil War, the ability to transmit a message over metallic conductors was considered a miracle. Yet, in the last decade, the ingenious communication engineer developed means of employing metallic circuits in such a way as to get double or even triple duty from each system. In the last few years, even this has been improved. Engineers devised means of putting five or more phone conversations and telegraph signals on such circuits, thus giving a multiplicity of service with the very minimum of material. In the past, this efficient utilization was confined to the stablized permanent installations. Modern warfare, requiring the maximum communication facilities with the minimum of equipment, has put this modern miracle into the field. Special Spiral Four Cable, developed by the Signal Corps in conjunction with industry, has established new conceptions in long range field communications. The Spiral Four Cable has no real commercial counterpart; so in order to acquire both equipment and cable, it was necessary to develop a new technique, develop sources, and educate personnel in production procedures.

These expansion efforts involved many considerations. There was the small business man, for instance. He was being forced out of business at the very moment that the government needed every facility. To penetrate to his shops with Signal Corps orders, a program of subcontracting was instituted at the very beginning of the war.

As a result, watch manufacturers are now making electrical instruments; Christmas-tree light manufacturers are turning out capacitors; photographic suppliers are making variable air capacitors; tabulating machinery companies, *Selsyns;* elevator manufacturers, *Amphlidynes;* can companies, hydrogen generators; amplifier manufacturers, crystal assemblies and dynamotors.

The switchover brought a procurement problem once re-

(*Continued on page* 443)

DISTRIBUTION

This war has often been referred to as "a war of supply." The Distribution Division "gets it there."

By Colonel GEORGE I. BACK



Born in Iowa, 1894. Graduated Morningside College, 1921; attended Yale; graduated Signal School, 1934, Command & Genl. Staff School, 1939. Was with Research & Development Division, Office of Chief Signal Officer, 1924-29 & Signal Corps Labs., 1930-33; Officer in Charge Plant Division, Office of Chief Signal Officer, 1934-41; Assistant Signal Officer, Genl. Headquarters, United States Army. He was Executive Officer and Assistant Chief, Signal Supply Services, Office of Chief Signal Officer until assigned to present post as Director, Distribution Division.



Original test model of radio-direction finder SCR-551-T1.

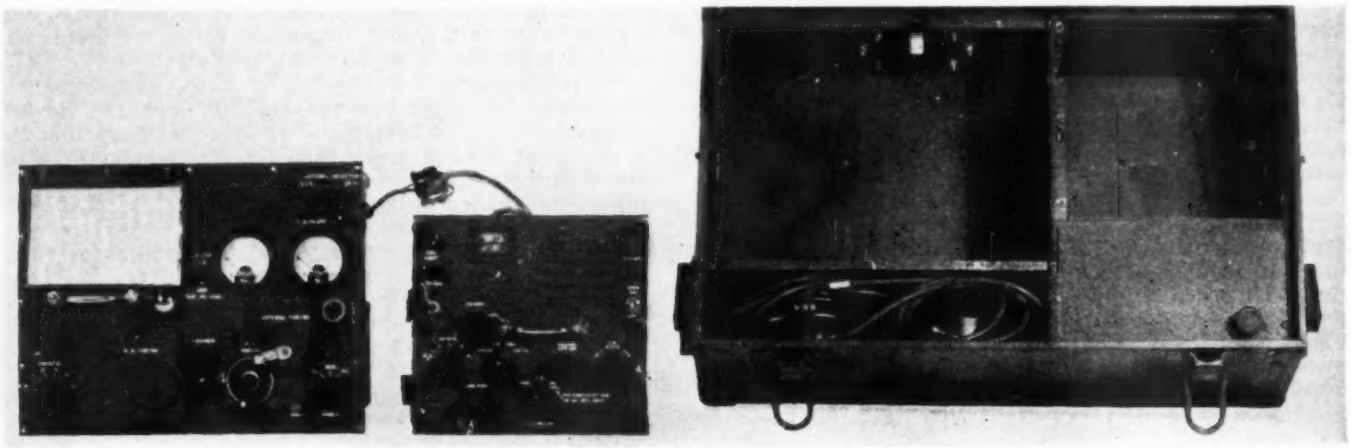
TO THE Distribution Division of the Signal Corps has been assigned the tremendous task of getting equipment into the hands of the men who must "get the message through." To accomplish this job one of the largest organizations within the Signal Corps has been built up; an organization employing 17,465 enlisted men and civilians in Signal Corps depots alone. This organization must receive, store, ship, and sometimes repair or process the communications equipment and photographic supplies for the entire Army. Thousands of problems have arisen in handling the equipment and in the assembling, packaging, and repairing the many different items for which the Signal Corps is responsible. Many changes in method, organization, and operations as the Army expanded have been required to solve these problems and to insure getting the proper materal to the right places at the right time.

Probably the two greatest problems the distribution organization of the Signal Corps was called on to face, when the decision was made to expand the Army from four million to ten million men, were a shortage of manpower and a shortage of depot space. These were foreseen, however, and plans had been made to meet and overcome these problems. Manpower would be lacking, but there were women ready and willing to work. The warehouses were filled but there was still space to be had, space between the tops of present piles of stocks and the ceiling. But how could women do the back-breaking work of men and how could this vertical space be utilized? The Distribution Division found this answer in a device known as the fork truck. With the aid of this equipment, women could handle and transport heavy loads and could, in addition, easily pile these loads to heights of 18 to 20 feet.

The fork truck is squat and has wheels of about the size of a "Kiddie" car. At its forward end, it is equipped with a "Mast" consisting of two vertical steel tracks on which travels a protruding device having two fingers or forks. In a matter of seconds this truck can move up to a pile of stock, pick it up on its stout forks, run across the warehouse, raise it to a height of nine or twelve feet, and deposit it on the top of the pile. One girl with this device can do the work which, when formerly done manually, required a dozen men and can lift and stack even such heavy items as 6000 lb. power units without any help from other workers.

To assist in the utilization of this device, pallets are used. A pallet is a rectangular platform about 3 or 4 feet

Radio receiver and transmitter SCR-583. Portable carrying case contains necessary attachments and spare parts.





Attachments and spare parts that are used with radio set SCR-194.



Naval officer acting as beach master during amphibious operations.

square constructed in 2 layers of 1" boards separated by 3 two-by-fours on edge. Material is piled on the pallet. The fork truck inserts its forks between the two platform layers and thus easily moves the loaded platform.

Today over 150,000 of these pallets are used in Signal Corps warehouses and the number is growing rapidly. The use of this equipment has enabled Signal Corps depots to handle loads as great as 30,000 tons per month, a tremendous amount of material when one considers that much Signal Corps equipment is measured in ounces rather than pounds.

To get the equipment to the fighting fronts intact and in condition ready for use has required thought, planning, and action generally referred to under the head of packaging. This term is somewhat of an understatement when it is realized that the powerful radio transmitter-receiver SCR-299 is being shipped overseas completely installed in a truck, crated, sealed and waterproofed. The crate used for this purpose assumes some of the general characteristics of a summer cabin.

In the last war Signal Corps material was generally unloaded at established ports on regular docks. In this war much Signal Corps material is unloaded on beaches and not infrequently floated ashore through the surf. In many cases it remains exposed to the elements for some time before it can be forwarded to the using units. For instance, in the landing at Guadalcanal many batteries were ruined in the surf.

To protect the material from the results of such operations, it has been necessary to develop a new technique of packing. This generally calls for the treatment of the container so that it may be immersed in water with no damage to the contents. Batteries, for example, are now sealed in waterproof paper and can be brought ashore through rough seas if necessary.

Green lumber is often used for packing with the result that there is built up a moisture content inside of such packages. To protect the contents against this condition, Signal Corps includes in such packages a chemical compound known as silica gel which absorbs and retains any moisture built up inside the package.

The packaging task of the Signal Corps is a gigantic undertaking. Much has been done by the Distribution Division and much still remains to be done. One interesting example of packaging problems is that of feed for homing pigeons. This feed at times in the past reached the front infested with vermin. Without feed, pigeons cannot live; without pigeons as auxiliary means of communication, some hard pressed American soldiers might perish. Now, in each shipment of pigeon feed, a small cylinder of gas is included and this gas, slowly escaping during transit, kills any vermin without injuring the feed.

Marking is also a responsibility of this Division. Much of the material moves forward under code designations representing overseas destination. Even a slight error may lead to serious delay or to the failure of the material reaching the proper troops. The Distribution Division has worked tirelessly to see that depot personnel and the suppliers are instructed so that errors in marking will not occur.

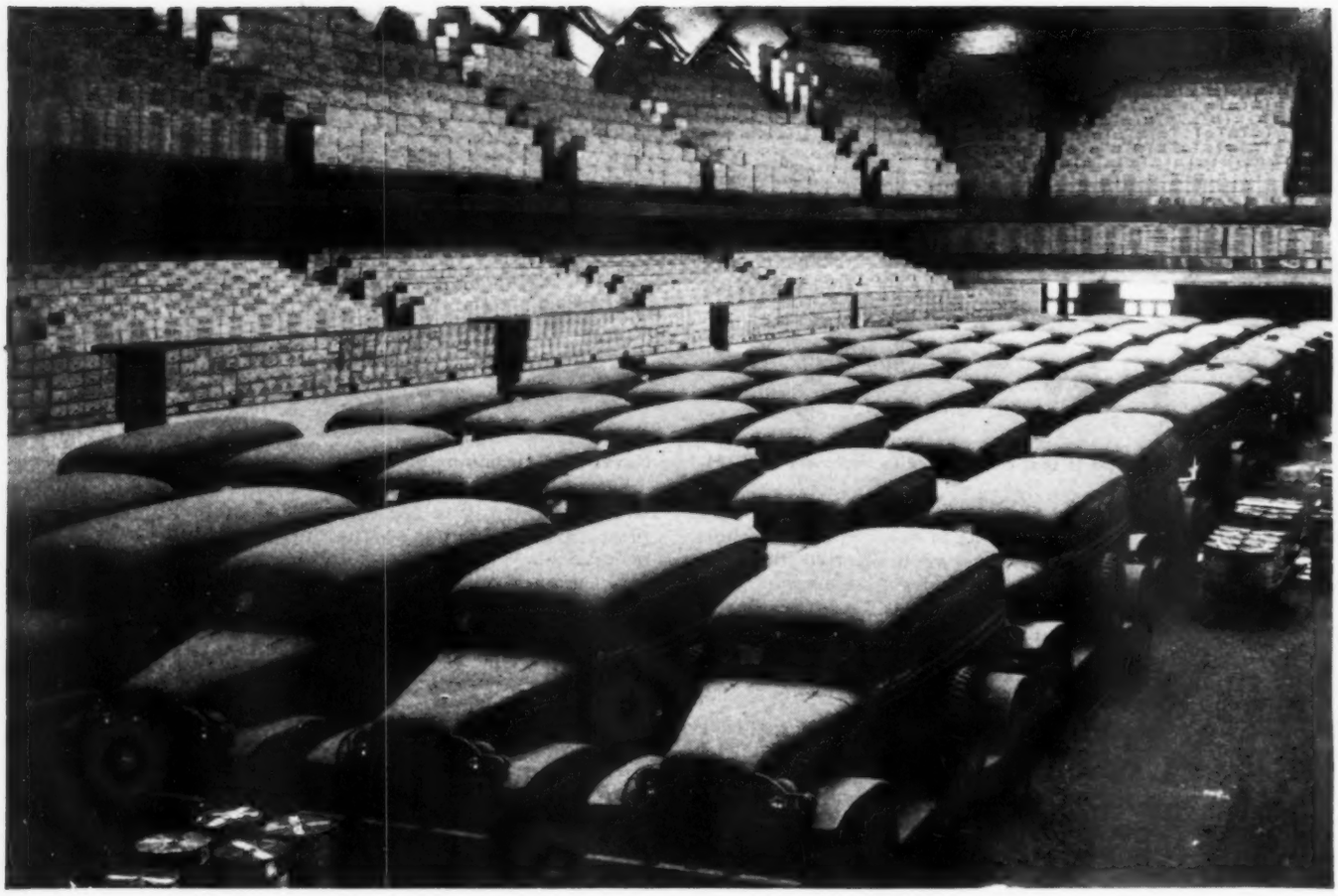
No matter how sturdily Signal Corps equipment is constructed, it is essentially delicate mechanism and should be handled with care. Simply placing that familiar admonition on a container does not solve the problem since the crate or box may be handled by stevedores of every nationality as well as natives and others unable to read even their own language. One of the most amusing and effective devices used to warn illiterate longshoremen against turning the bottom side up was worked out by a British officer. On the sides of the crates he ordered stenciled a huge mug of foaming beer right side up. That was something that all cargo handlers can understand. They were careful "not to spill the beer." Every crate went right side up.

The Stock Control Branch is responsible for planning and directing the tremendous task of making proper distribution of Signal Corps equipment to the troops. This requires continual vigilance to insure proper stock at the proper point at the proper time. In order to accomplish this, there is established a staff in Washington and an operating force in the Storage and Issue Agency at Philadelphia. These groups must meet the problems of keeping the depots properly stocked at all times and of insuring the proper assembly of the many components required and then of speeding the material to the ports on time and in recognizable condition.

The problem of stock control is constantly becoming more complex in that unexpected demands are being received daily from the fighting forces in all sections of the world. For example, when General Eisenhower's troops were being equipped for the North African campaign, they were given the number of mine detectors deemed adequate. There was no way of knowing then that other Allied troops would look with such favor on the mine detectors issued by our Signal Corps and thus skyrocket the demand. By the time the African campaign was over, more than ten times the original number of mine detectors had been sent to Africa. Such unexpected demands are usually urgent and must be met promptly. A shipment of this kind usually involves the assembling of a multitude of component parts of equipment stocked at several Signal Corps depots. Each shipment must be clearly marked so that it will retain its identity and thus insure arrival of material as planned.

The movement of supplies has to be coordinated with the Transportation Corps and ports of embarkation to insure that all equipment arrives in accordance with a preestablished time table as set by convoy movements. There are occasions when a convoy is forced to split up and part of the equipment is landed in a port hundreds of miles from its original destination. Unless the missing equipment can be located and rushed to its original destination so that the parts of the original shipment are brought together, there

(*Continued on page* 448)



International Amphitheatre, Chicago—now used as a Signal Corps Depot. Radio set SCR-299 will be installed in each truck.

DEPOTS

The Signal Corps requires thousands of skilled personnel to handle more than 100,000 individual items ranging from tubes to trucks.

By Brig. Gen. EDGAR L. CLEWELL



Born in Minnesota in 1896, and has B.A. degree, Moravian College & Theological Seminary, 1916, and M.A., Columbia U., 1922. Graduated Tank School, 1923; Chem. Warfare School, 1929; Signal School, 1934; and Comm. & Genl. Staff School, 1940. Served as Executive to Signal Officer of Hawaiian Dept., 1927-28; Director of Dept. of Training Lit., Signal School, 1928-30; Signal Officer, 4th Army Corps, 1940; Executive Officer, Ft. Monmouth, N. J., 1940-42; and Comdr. of Signal Corps Replacement Training Center, 1942-43. Named Comm. Genl., Chicago Signal Depot, 1943.

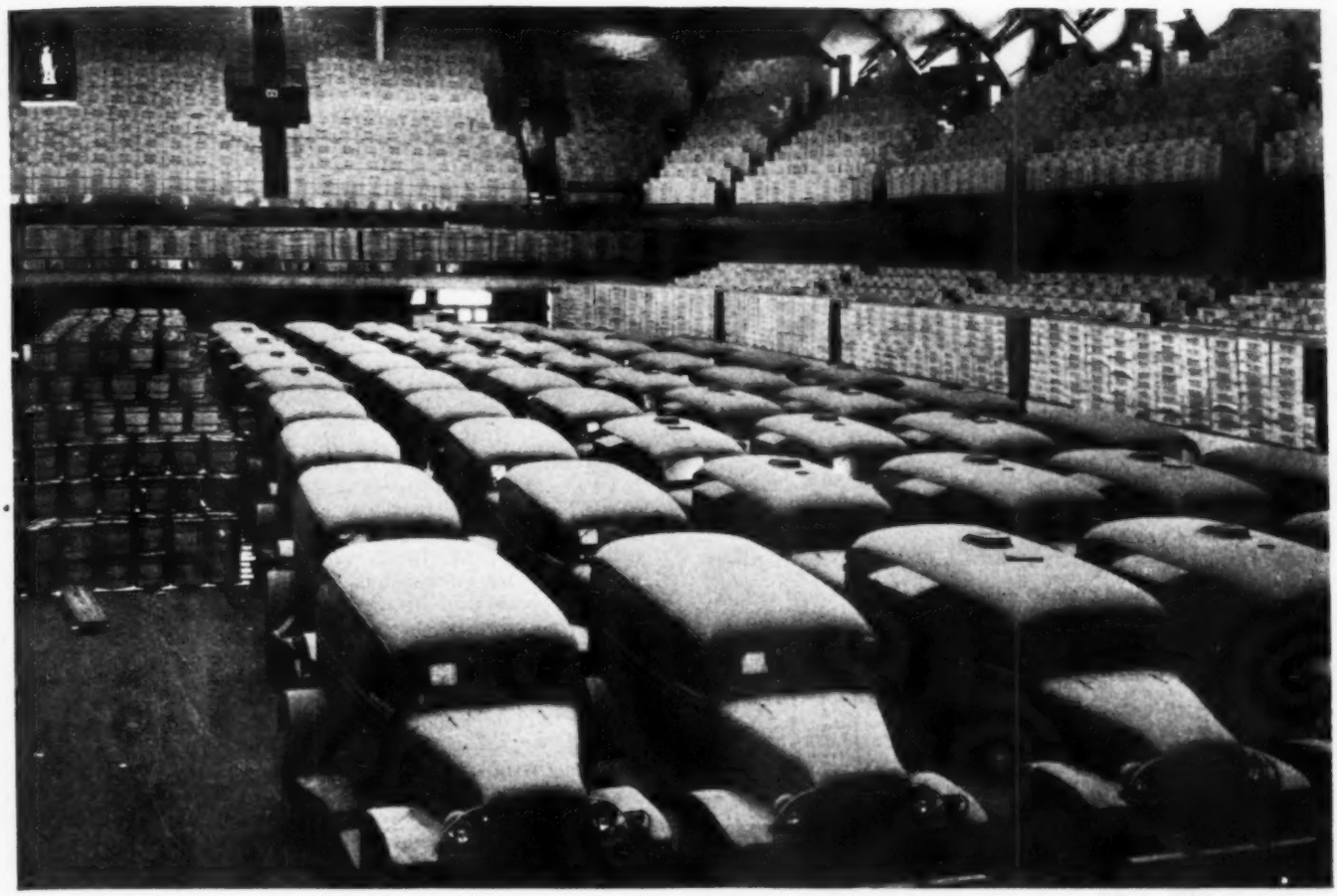
A GREAT chain of depots, reaching from coast to coast, is the backbone of the Signal Corps supply system.

Into eight depots, at Philadelphia, Boston, Chicago, Lexington, Ky., Los Angeles, Baltimore, Sacramento and Seattle, as well as at signal sections at Army Service Forces depots at New Cumberland, Pa., Bellemead, N. J., San Antonio, Atlanta, and Ogden, Utah, millions of dollars worth of communications equipment flows from war plants on its way to battle zones all over the world. The success or failure of the entire Army communications system, the nerve center of the armed forces, rests upon the speed and efficiency with which this equipment is handled.

With more than 100,000 individual items, ranging from midget tubes to huge mobile broadcasting stations, to be received, stored, classified, and shipped, the Signal Corps requires a highly-trained staff of civilians and officers who are thoroughly familiar with modern warehousing and shipping procedures as well as with the equipment itself. Efficiency is vital, for a damaged or defective unit or one delayed in delivery, which in peacetime would mean only inconvenience, today may well mean loss of life or defeat in battle.

In the huge Signal depots, all effective peacetime warehousing and shipping procedures have been utilized, adapted, and geared up to wartime demands. Systems which may have been adequate a year ago, or even six months ago have made way for improved methods as the tempo of warfare changed from preparation to attack.

Simplification of operation, eternal vigilance to minimize the elapsed time between requisition and shipment, efficiency of warehousing, reduction of wastage, the ability to anticipate and gauge army consumer demand; all these



require the 24 hour-a-day services of the vast Signal depot personnel.

Great strides have been made in perfecting a smooth functioning operation. These huge depots are more than depositories for the thousands of items needed to maintain army communications. They are in effect individual industrial cities geared up to wartime tempo. Inside their heavily guarded walls are endless acres of warehouses, shipping rooms and shops, as well as offices where multitudes of records are handled with speed and efficiency. The adjacent yards are packed with trucks, poles, cable reels and other heavy equipment. Railroad spurs facilitate storage and handling.

Signal depot organization falls into seven divisions: stock control, storage, maintenance, administrative, personnel, utilities, and transportation. These are correlated in their activities by an Executive Officer and an Executive Control Office. The Executive Officer, who acts directly on matters which do not require the personal attention of the Depot Commander, is the coordinator of all depot activities in accordance with established policies and procedure. The Executive Control Office is responsible for the planning and analysis of all depot procedure and activities, and initiates changes and improvements indicated by current developments.

There are two main operating divisions, closely interrelated. The Stock Control Division is responsible for maintenance of all depot stock records pertaining to Signal Corps equipment and supplies. This division includes three branches: Inventory Control, Property, and Stock Accounting. This division issues orders enumerating articles to be shipped, shipping dates, and destination. These orders are transmitted directly to the Storage Division, which is responsible for storage of all materials from the time the supplies are received in the depot until final shipment is made. This is usually the largest of the operating divisions.

In order to function smoothly, this division is usually subdivided into five functional branches: a Labor and



Enlisted men receive their training in telephone equipment repair.



Broken Package Room—"Pickers" sorting items to complete orders.



Repair Shop—operator making adjustments on electrical meters.



Garage—mechanics repairing lift trucks used at depot stations.



Worker at the Philadelphia Signal Depot repairing radio head-set.

Equipment Branch, which furnishes all the labor and equipment used in the storage and shipment of materials; a Stock Numbering Branch, which checks and assigns identification numbers to all equipment received at the depot; a Storekeeping Branch, which maintains stock location records and is responsible for the selection of the proper stock to fill the requisitions, and also includes the packing of equipment upon proper requisitioning of these items; the Internal Transportation Branch, which operates all equipment used for internal transporting materials; the Cycle Inventory Branch, which makes regular and special inventories of all depots' stocks, correlating these checks with other depots' records.

Another main division of the depot related to the administrative and operating functions is the Maintenance Division, charged with the responsibility for repairing, manufacturing or fabricating parts for all types of Signal Corps communications equipment which are sent to the depot for fifth echelon (major) repairs. This division requires highly technical and skilled personnel.

In order to simplify operating divisions, administrative details are placed under separate responsibility. The Administrative Division is responsible for the maintenance of records of all funds allocated to the depot and all accounting for such funds. It is responsible for the security and protection of the depot from theft, sabotage and fire, and maintains identification systems for civilian personnel and visitors. The Office Service Branch is responsible for all service functions such as messengers, office supplies, office equipment and repairs. The Procurement Branch comes under the Administrative Division and is responsible for the procurement of all items for which purchase is authorized in the jurisdiction of the depot.

The Personnel Division is charged with all matters pertaining to the administration of both civilian and military personnel. It is responsible for the recruitment, interviewing, investigation, classification, promotion, transferring and terminating of civilian personnel, and also administrates employee relations, welfare, and morale programs. It is responsible for medical service, first aid and sanitation within the depot. This division also conducts employee-participating programs such as War Bond sales, Community Fund and Red Cross drives.

The Utilities Division maintains all depot buildings, ground maintenance, electrical, plumbing and heating installations, does minor construction and alteration work for all divisions of the depot, and provides janitor service. This division cooperates with the Post Engineer who is responsible for all repairs and installations of a major nature which are ordinarily handled through Engineer Corps facilities.

The Transportation Division acts as transportation agent for the depot and consolidates all rail and motor shipments to insure economical and expeditious transportation under Army and Interstate Commerce Commission regulations.

In order to circumvent manpower shortages, it has been found necessary to set up in-service training programs sponsored or correlated by the Personnel Division. These training programs usually consist of refresher courses for stenographers and typists to acquaint them with military and technical terminology used in Signal Corps procedure, courses to assist operators of accounting and office ma-

(*Continued on page* 378)

COLOR PHOTOGRAPHS

The photographers of Army Pictorial show their craftsmanship in the natural Kodachrome shots appearing in the section following.



Major General HARRY C. INGLES

Chief Signal Officer, U. S. Army



Field telephones provide communications over wires laid in combat areas.



Latest FM walkie-talkie provides reliable short-range communications between scouting parties and other units.

Field telephones permit privacy in territory where enemy troops might pick up signals from radio equipment.





SCR-299 mobile transmitter installed in half-trac. This unit travels easily over sand and rough ground.

SCR-608 FM set used by the Field Artillery. It is a multi-channel transmitter-receiver of late design.





Wire crew draws a vital thread for important communications between two units of troops.



The Army SCR 399-A mounted on a 2½ ton truck. Complete radio station may be easily removed.



Servicing the famous Gibson Girl emergency automatic radio lifeboat transmitter.



Medium-power transmitting-receiving station will be in operation a few moments after these troops arrive with antenna poles-wire.





Up the side goes this signalman with wire reel as troops prepare to embark to sea.



Signal Corps troops disembarking with their portable radio equipment. Heavy units will follow in barges.



⬆ Signalling by semaphore to advance troops on shore as landing barge brings reinforcements.

⬇ On shore. Signal Corps troops advancing with collapsible poles and light equipment



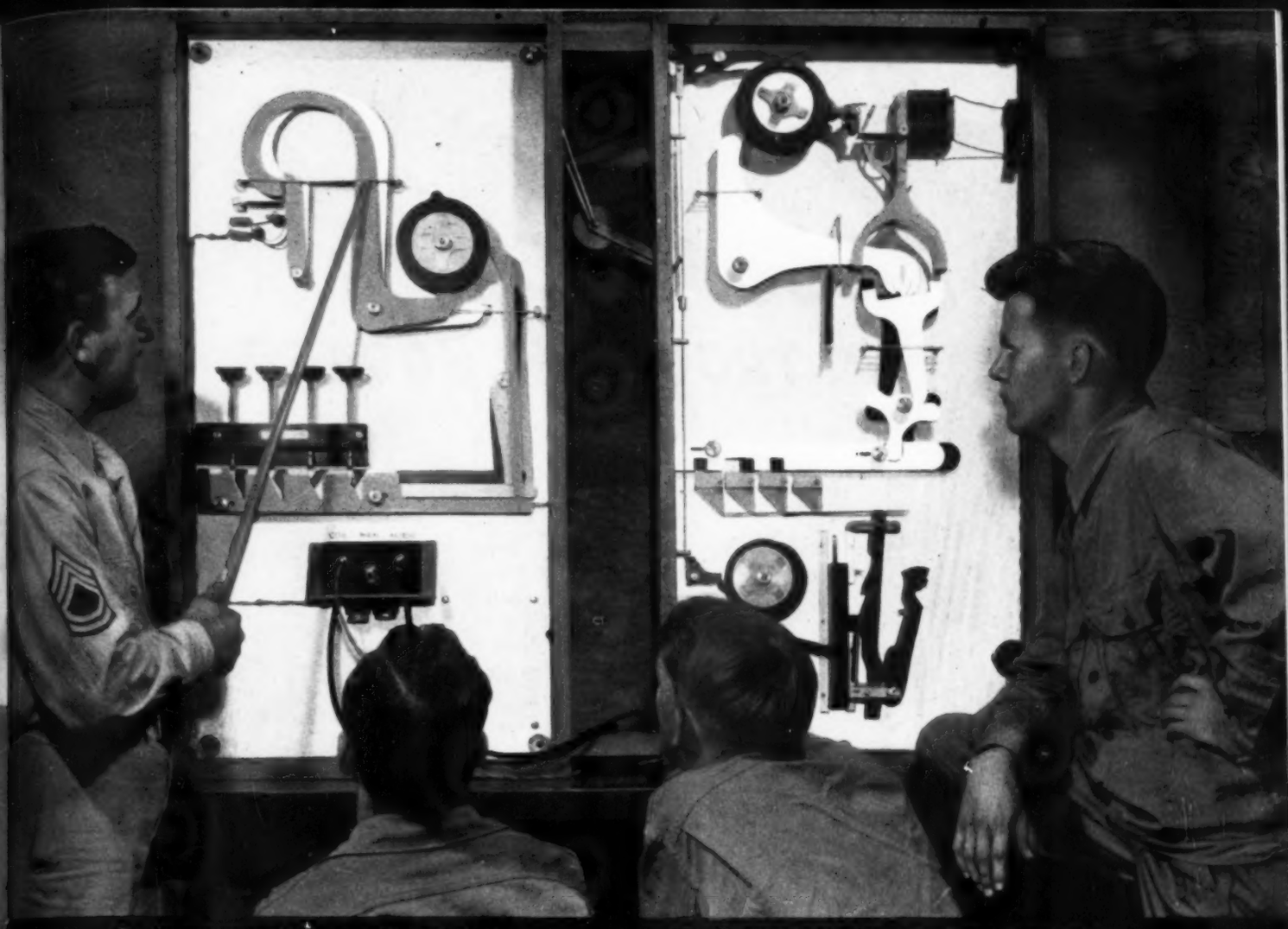


Highly-perfected camouflage technique is saving countless lives. Signalman holds Handie Talkie—other is alert for snipers.



A radio operator of the WAC. Women are handling many jobs in various branches of the S. C.

Portable field telephone setup operated by feminine operators. They are all skillfully trained.



Instructor explains operating principles of a working-model teletypewriter.

Demonstrating the hows and why of a communications receiver to Signal student.



Thanks
MR. TROUBLE-SHOOTER



Thanks, Mr. G. I. You're close to our thoughts. All of us in radio know the world-wide job you're doing in the Signal Corps.

We know who you are. You're the radio ham across the street, the boy home from college who burned the midnight oil in the attic and rigged his aerial from the highest mast. You're the telephone man. You're the obliging young fellow from the lighting company. You're the serviceman who fixed our radio set the day before the World's Series. You're the radio engineer who added brains to that set.

We don't know where you're *seeing* action but we know that you are *helping* it. Crawling out ahead of artillery. Scrambling from one fox-hole to another. Rolling up telephone wire almost to the muzzles of enemy guns. Operating and servicing communication systems so that the attack may roll forward. Hunting booby traps. Saving lives.

Come back, Mr. G. I., just as soon as your trouble-shooting is done. Radio will need you—your skill—your sureness. Radio will not forget your part in victory. Solar Manufacturing Corporation, 285 Madison Ave., New York 17, N. Y. Plants at Bayonne, N. J., West New York, N. J., Chicago, Ill.

CAPACITORS AND RADIO NOISE-SUPPRESSION FILTERS

SOLAR

SIGNAL SUPPLY IN THE E T O

Their job is to supply everything from porcelain eggs to multi-wheeled trucks.



Office of a typical Signal Depot—a quickly erected Nissen hut used widely in the European Theater of Operations.

By
Colonel ALFRED M. SHEARER



Born in 1894. Attended U. of Mich. Entered service 1917; in Philippines, 1923; promoted to Captain, 1920; with Signal Corps Procurement Dept. Graduated Signal School, 1928. Served Supply Div., 1932; promoted to Major, 1935. Instructor in the Signal School; Supply & Contracting Officer at Aircraft Radio Lab. Promoted to Lt. Col., 1940. Signal Property Officer at Brooklyn Genl. depot; Signal Officer, Panama Pacific General Depot. Promoted to Col., 1942. Served ETO as Director, Supply Div.; Director, Communications Div.; and present assignment, Deputy Chief Signal Officer.

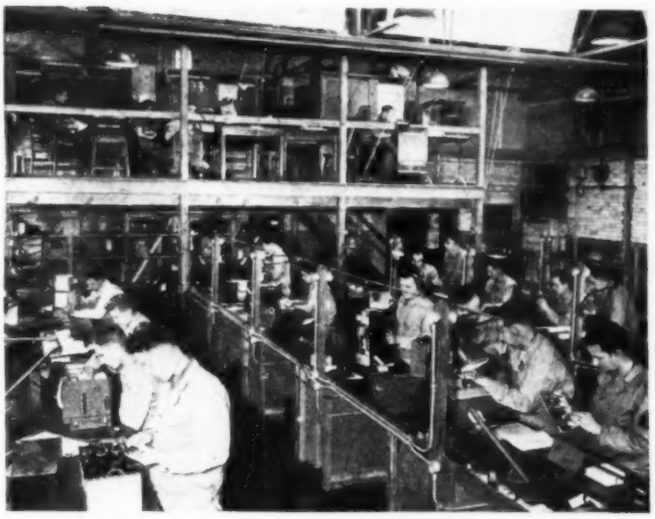
WHEN armadas of ships, armies of men, and umbrellas of planes thunder against enemy shores, the success of the mission depends in part on the perfection of the means of communication available to the commander. Paralleling the months of training and hardening the men, goes the procuring, maintaining, storing, issuing, and handling of the required signal equipment. This ranges from porcelain eggs, that are used for fooling homing pigeons into laying real eggs, to powerful mobile radio sets that travel in multi-wheeled vehicles. There is neither glory nor fame in this half of the job but to the men in "Supply," jealous of their division's position and proud to be the hub of the signal service, the job needs neither glory nor fame to become the driving force in their lives.

It is the responsibility of the Chief Signal Officer, Services of Supply, European Theater of Operations, to accumulate supplies for the American military forces in this theater in advance of anticipated needs and to issue these supplies to the troops as needed. A related activity is the repair of damaged equipment which cannot be handled by combat elements in the field because of lack of time or the necessary tools.

To discharge its duties efficiently, the Signal Supply Service is organized to comprise an executive office and several branches. The basis of the whole organization is flexibility; this applies to methods of thinking as well as to such physical matters as the location of depots, means of shipping, methods of handling the ever-growing paper work, etc. The various activities are completely integrated and under the control at all times of officers with wide experience in both military and civilian life.

The basic considerations in the operation of a supply system may be outlined as follows:

a. Requirements for maintenance.
b. Reserve to be maintained.



Corner of a modern repair shop in a large Signal Corps Depot.



Well-stocked service bench used by the Signal Corps repairmen.

c. Sources of procurement.
d. Method of requisitioning and procurement.
e. Method of storage and distribution.
f. Flow of supplies.

For the ETO, these factors may be summarized briefly as follows:

The normal maintenance percentages for a theater of operations are established by the Office of the Chief Signal

(*Continued on page* 374)



Five-hundred watt power unit supplying 110-volts a.c. for electric lighting and communications equipment.

ENGINEERING

By Maj. Gen. ROGER B. COLTON



Born in North Carolina in 1887. Holds Ph.B. in Elec. Engineering, Yale University, 1908; and M.S. in Elec. Communication, M.I.T., 1920. Graduate of Coast Artillery School, advanced engineering, 1922; advanced course, 1927; Command and General Staff School, 1928; and Army War College, 1938. Was Signal Officer, Panama Canal Dept., 1930-32; Officer in Charge, Plant and Traffic Div., 1932-34, and Research and Development Div., 1934-36, Office of Chief Signal Officer; Chief, Signal Supply Services, 1941-43. Is now Chief, Engineering and Technical Service.

The Engineering and Technical Service is responsible for research, development and standardization of SC sets.

DURING the past year our new Army has entered into successful combat with our enemies in nearly every theater of this widespread war. During the year, reports have become available as to the battlefield performance of U. S. Army signal equipment and as to the capabilities of the equipment to meet the ultimate test: of combat in the hands of combat units.

It can be stated as a result of this experience that:

1. The performance of our signal equipment is second to none.

2. Despite extensive and arduous testing in development, and in training service, minor mechanical weaknesses in some equipments were discovered during early combat and immediate action was taken to correct them.

3. The many precautions taken to increase design safety factors, to improve the quality of component parts, and to obtain high quality controls in manufacture by careful inspection, have all proven more than justified by the final test of combat use. Further work has been done and must be continued to improve quality, increase the capabilities of equipment to withstand the elements, and to reduce maintenance.

The foregoing summary touches upon some of the principal responsibilities of the Engineering and Technical Service of the Signal Corps of Army Service Forces. As one of the five services commanded by the Chief Signal

Officer, the Engineering and Technical Service is responsible to him for the research, development and standardization of communication and other electronic equipment employed by combat elements of Army Service Forces, Army Air Forces, and Army Ground Forces. Included in these responsibilities are the essential elements of specification preparation and revision, improvement and refinement of equipment, establishment of quality control standards for use by the Signal Corps Inspection Agency, standardization of component parts, and establishment of maintenance policies.

Of course, the Army is only one of the Armed Services; its communication and electronic needs must be integrated and coordinated with the large requirements of the Navy, Marine Corps, Merchant Marine, and with the requirements of Lend-Lease. The United States Navy has extensive development facilities with which the Signal Corps maintains the closest possible liaison to the end that advances made by either development group are available to the other and that no unnecessary duplication of work takes place.

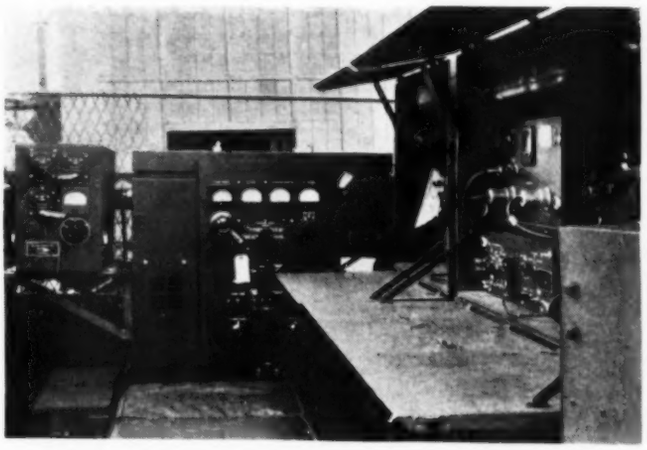
The development agencies of the Armed Services are greatly augmented by the effective and comprehensive research and development facilities of the National Defense Research Committee, which operates under the Office of Scientific Research and Development. This outstanding scientific body has mobilized an important part of the scientific resources of the nation for the accomplishment of important research and development work for the Armed Services.

When a need arises within the Army Air Forces, Army Ground Forces, or Army Service Forces, for a particular type of electronic equipment for which no design exists, the Service concerned establishes the nature of its need and makes application for the development of equipment to meet it.

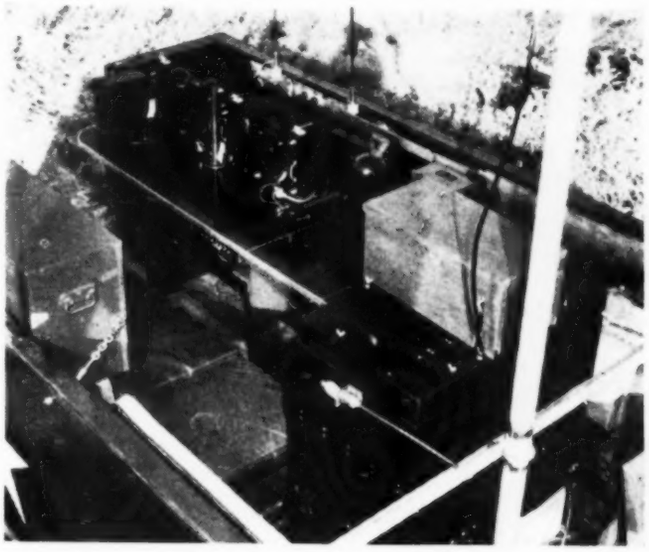
It then becomes the responsibility of the Army Service Forces, through the Chief Signal Officer and in turn the Engineering and Technical Service, to coordinate, plan, and effect the development of the equipment.

A study is then made to determine the elements of the problem, the nature of the research or development work involved, and the coordination which can be effected with any similar type of equipment under development for any of the Armed Services.

Assuming that a new development is required, the most suitable research and development facilities are examined; if possible, development by the National Defense Research Committee or a commercial laboratory or manufacturer is started. (*Continued on page* 340)

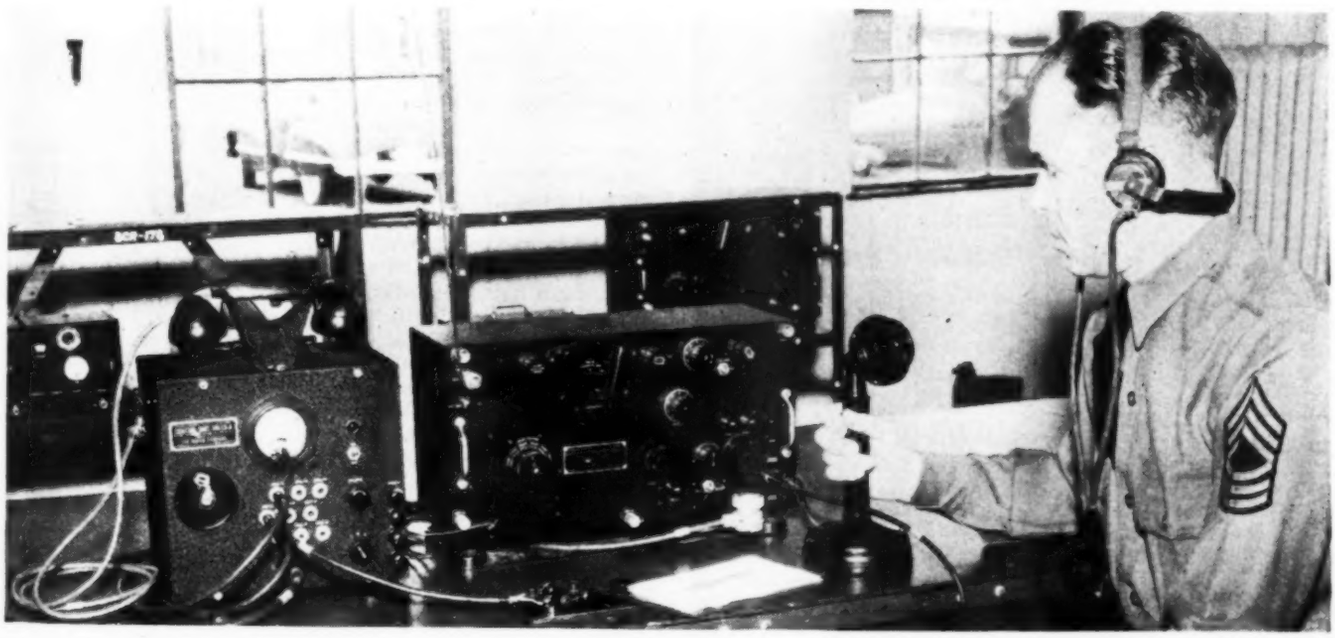


Components of radio set SCR-399-A and SCR-499-A installed in the rear section of a half-trac M3 personnel carrier.



Widely used SCR-299 mobile radio transmitter installed in an M3 half-trac. Unit is used in many other mobile forms.

SCR-18-A receiver and transmitter installation. All controls are within easy reach of the operator.



INSPECTION AGENCIES

The Agency is composed of five separate zones, a HQ organization and a liaison section. They maintain a staff of highly skilled men.

By Col. LESTER J. HARRIS



Born in Urbana, Missouri, 1886. Graduated from the Signal School in 1926. In Panama in 1927. Was in the Office of the Assistant Secretary of War in 1932. Received the degree of Master of Business Administration from Harvard University in 1932. Graduated from the Army Industrial College in 1936, and assigned to the Materiel Branch, Office of the Chief Signal Officer, in 1941. Was assigned to the San Francisco Signal Corps Procurement District in 1942. Returned to Materiel Branch. Appointed to present position as Director of Signal Corps Inspection Agency in 1943.

Inspecting leather case EE-8-A for field telephone unit.



IT IS obvious that defective communications equipment shipped to the fighting front is worse than no equipment at all. In the first place, faulty equipment means that much waste of precious shipping space. But even more important is the fact that fighting men have come to trust their lives to the sureness of their communications, and the slightest failure, at a critical moment of battle, could easily be transformed from minor tragedy to vast disaster.

Because of this vital importance of communications in every phase of modern combat, the Signal Corps employs a sharp-eyed, carefully trained staff of inspectors who maintain ceaseless vigilance in the plants of Signal Corps contractors throughout the nation. Around the clock they are on guard against every possible defect, whether it be caused by honest mistake, accident, negligence, sabotage, or fraud.

This corps of sentinels-of-the-assembly-line is supervised by the Signal Corps Inspection Agency, Dayton, Ohio, an organization which in some respects is unique among the Army units which make up the mighty chain of supply from factory to battle line. It is also one of the newest, having begun operation October 5, 1942.

For nearly 25 years, Signal Corps inspection had been accomplished by inspectors working under the direction of individual contracting officers from procurement districts and laboratories. During the latter part of 1941 and early 1942, however, it became increasingly evident that this system lacked coordinated direction, even though its many individual parts might be operated with high efficiency. Although the system had functioned satisfactorily on a small scale, the tremendous expansion of Signal Corps procurement that followed the entry of the United States into the war, had created a whole new set of problems. It was not uncommon for a manufacturer to find himself dealing with several sets of Signal Corps inspection units, each operating under different policies and procedures.

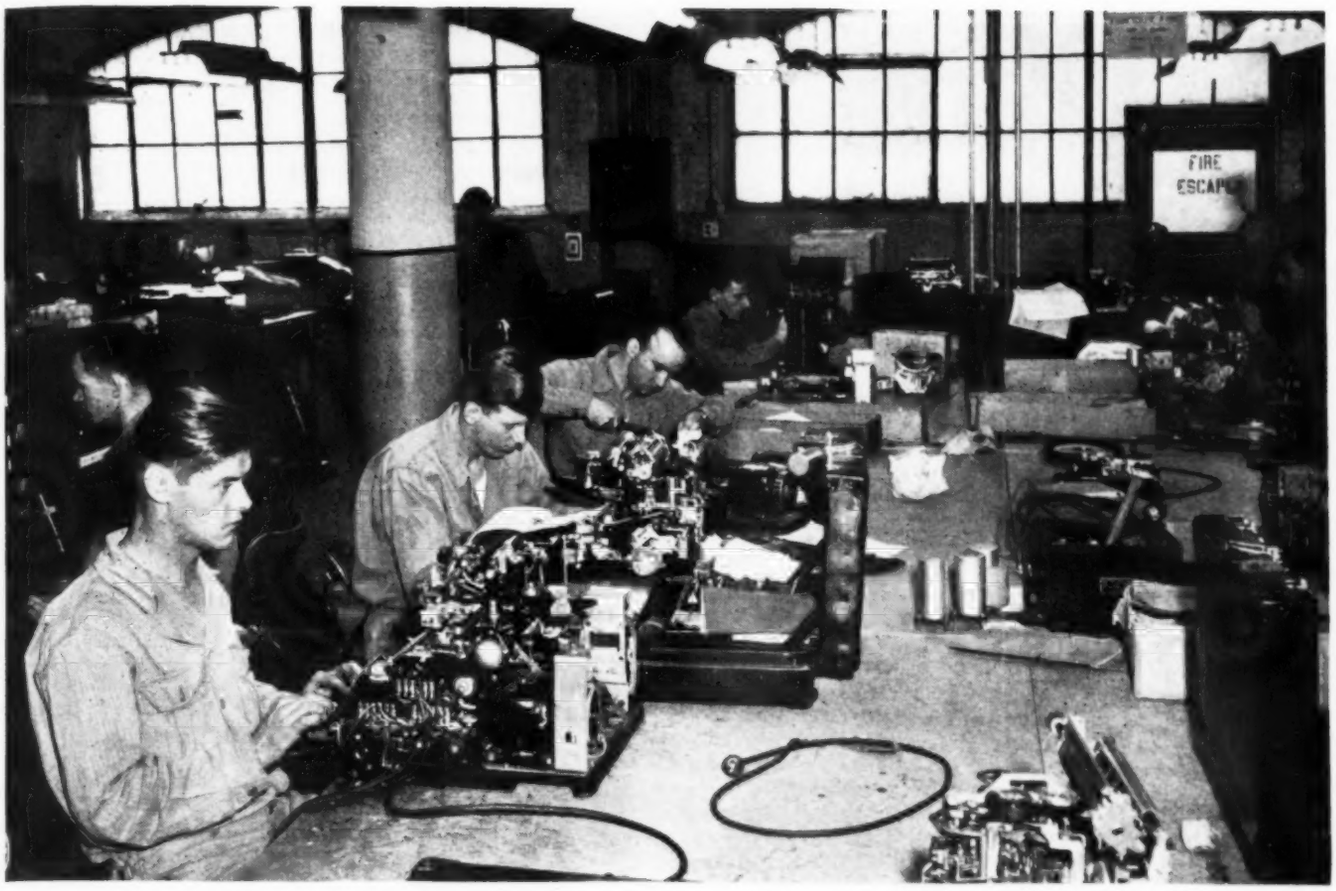
At the same time, a diminishing manpower supply made it imperative that the most efficient possible use be made of the limited number of skilled technical and engineering personnel needed to cope with inspection problems.

The Office of the Chief Signal Officer ordered a comprehensive survey of the situation, which resulted in a report which said in part:

"The present organization of inspection, consisting as it does of several separate and uncoordinated systems, causes a duplication of supervision at numerous plants throughout the country. It makes inefficient use of such first-class supervisory personnel as is available and has a tendency to place, in positions of general responsibility, individuals who are proficient from a technical standpoint but are lacking in administrative ability or experience, or who are good supervisors but not well rounded out technically. The present system also makes inefficient use of subordinate personnel. At plants where two or more inspection units are located, cases may be observed where one unit is overloaded with work while another unit is temporarily marking time, and where the temporary shifting of a limited number of subordinate inspectors, at the location, would equalize the load.

"The lack of uniformity, as to policy and practice in the present inspection system, fosters a lack of trust and confidence between inspection units which, in turn, tends to lower the morale of the force, as a whole, and to lower its prestige with contractors."

As a result of this report, all Signal Corps Inspection



Teletype repair shop—units are returned to depot where necessary repairs and adjustments are made.

was consolidated under a single agency, and the function of inspection, except for materiel in the pilot run or the development stage, was separated from the laboratories and procurement districts, the new agency serving, however, as agent for both.

The Agency is composed of five separate zones, a small headquarters organization exercising coordinating and policy control functions, and a small liaison section in the Office of the Chief Signal Officer in Washington. The zone headquarters are located at Chicago, Dayton, Newark, Philadelphia, and San Francisco.

Each zone office is the center of control for all inspection matters within its designated area. The zone is the operating unit of the organization and has a semi-autonomous status, limited by (a) coordination and policy control from the director of the Agency in order to obtain uniformity of policy, (b) compliance with inspection instructions from the inspection engineering organization of the Signal Corps laboratories on products not completely out of the development stage, and (c) obligations to the contracting officer with regard to matters affecting terms of a contract.

Elimination of duplicate inspections was the most important and the first result of consolidating Signal Corps inspection under a single agency. Besides providing material savings in manpower, a Signal Corps contractor found himself dealing with a single inspection unit instead of several, automatically removing potential or actual confusion, loss of time, and unnecessary paper work with a constant speed-up of production and shipment. Likewise, the obtaining of testing equipment needed to insure proper operation of radio and electronic devices was facilitated.

It was quickly demonstrated also that reduction in the geographical distance between the field inspection units and the control centers to which they reported made for better administration. The system provided closer control necessary in a rapidly expanding program in which many of the products handled were relatively new to both the

Schooled in mechanics and minor repairs, women are driving 15-ton trucks, tractors, and other motorized equipment.





Inspecting Model 19 teletype printer at the point of manufacture.

manufacturer and the armed forces. The amount of business to be transacted at long distances was reduced to a minimum.

The organization is supervised by Signal Corps officers, but the bulk of the operations is carried on by more than 6,000 Civil Service employees scattered throughout the country, chiefly in small units but in some instances numbering several hundred in exceptionally large manufacturing plants.

One of the major jobs tackled by the Agency was to reduce paper work to a minimum and to speed the flow of essential paper so that this administrative phase would in no way slow up the shipment of equipment to the fighting forces.

The Inspection Agency is charged with determining whether Signal Corps materiel meets contract specifications, with accepting approved materiel on behalf of the government and with shipping the accepted materiel to the designated consignee from the manufacturer's plant. Handling many hundreds of millions of dollars of equipment, this involves considerable bookkeeping.

Formerly, however, three separate forms were required to accomplish this process. Now the Agency has devised and placed in operation a single form which serves as inspection return, receiving report, and shipping ticket, greatly reducing the size of the clerical force required to handle these records. This form, known as the Acceptance and Shipment form, has, in a large measure, also replaced a fourth form—the daily status report—by which the inspection organization supplied information to the Chief Signal Officer on the status of Signal Corps production throughout the country.

This speeding up of and reduction in paper work is worth emphasizing because it has meant two very important things—communications equipment gets where it is needed more rapidly than ever and the manufacturer gets his money. In most cases the necessary paper work, to enable the finance office to pay for accepted materiel, is completed within three to five days.

From the start the Agency recognized that it was confronted by an increasing load and a decreasing supply of trained personnel. Elimination of duplicate inspections helped greatly, but the problem was far from solved, so the Agency adopted a policy of employing and training women, many of them recent high school graduates, and men not physically qualified for induction into the armed forces. It is anticipated that inspection will provide ideal work for rehabilitation of soldiers disabled in the present war but still able to make a major contribution to the war effort.

Within less than a year the number of women inspectors rose from a scattered handful to more than 40 per cent of the total field personnel, and the ratio of women to men is expected to climb as the war goes on.

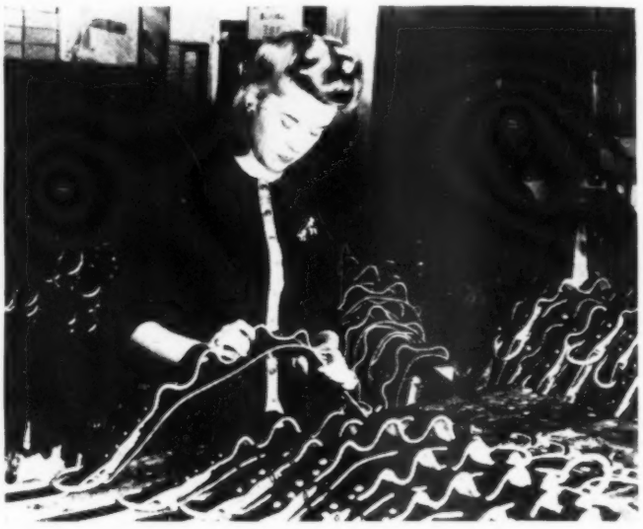
A number of all-female inspection units, including women inspectors-in-charge, have been established, and the results are gratifying.

While it was impossible to make electrical engineers out of several thousand young women overnight, an extensive training program was developed which has enabled them to become useful members of the organization in a very short time with little or no previous experience.

This training program is divided into two major parts, each complementing the other—pre-service training and in-service training. The pre-service training program was established with the cooperation of the United States Office of Education and the Service Commands, which provided facilities and instructors to do the job. Prospective inspectors were employed at regular government pay and given a six weeks' course of intensive training designed to give them a working knowledge of inspection duties and some technical instruction.

Graduates of these courses are given inspection assignments and their training is continued under the in-service program through frequent meetings, classes, and demonstrations.

The caliber of young women, who have been brought



Feminine Ordnance worker carefully inspecting linemen's belts.

into the inspection service through these training courses, has been exceptionally high. Many of them have husbands, brothers, or sweethearts in the armed forces and have sought this type of employment for patriotic reasons.

Although large-scale employment of women, for inspection duties, was approached with some misgivings, this has been shown to be unjustified. In many types of mechanical and repetitive inspection, women have proved themselves superior to men, especially, where the checking of small, minute parts is concerned.

The Inspector's job is a thankless one—it is commonly said in manufacturing plants everywhere that "nobody loves an inspector." The work is unglamorous, little publicized and frequently monotonous. In emergencies, it frequently means working long hours, without rest, to enable a rush shipment to go out. High morale is required to assure constant attention to every detail, so that there will be no deviation from Signal Corps specifications.

A Signal Corps inspector's judgment, on as small a thing as a piece of solder, may mean the difference between victory and defeat in an attack many thousands of miles away. There is no time to repair a broken connection in a radio when a tank commander is using it to direct his armored units in the middle of the battle. An airplane group commander cannot wait for his radio man to heat

(*Continued on page* 254)

OPERATIONS

To assist the Chief Signal Officer in the effective fulfillment of his mission is the job of this branch.



Under cover of smoke, Rangers withdraw as beach officer coordinates movements by radio, during African offensive.

By Brig. General F. C. MEADE



Born in Philadelphia, December 16, 1896; was graduated from U. S. Military Academy in 1917. Holds an M. S. degree from Yale University, 1933; and is a graduate of Coast Artillery School, 1918; Signal School, 1928; Command and General Staff School, 1938. Served as instructor in Signal Corps School, 1933-37. Was with War Plans and Training Division, 1938-41, when appointed Officer in Charge, Air Communications Division. In 1942 served as C.O. of Replacement Training Center, Camp Crowder. Made Director, Plans and Operations Division, 1943.

WHERE the war really comes home to Signal Corps headquarters in Washington is in the Plans and Operations Division of the Office of the Chief Signal Officer. Over the desks of the officers who make up this division flow reports, requisitions, requests, recommendations, and decisions from the field and from the high command. And from these officers go directives and orders in the name of the Chief Signal Officer to all the myriad activities that make up the Signal Corps, U. S. Army.

The Plans and Operations Division is a staff agency. In military parlance this means its job is to "assist the Chief Signal Officer in the effective fulfillment of his mission." To do this it "secures and furnishes . . . such information as may be required; prepares plans and recommendations for . . . policies; translates his decisions, plans, and policies . . . into appropriate orders; brings to his attention matters requiring action by him or about which he should be informed; studies continuously the operations for which he is responsible; and assists, advises, and coordinates the operating services . . ."

In plainer language the Plans and Operations Division is the Chief Signal Officer's alter ego, taking action with respect to Signal men and materiel on the basis of strategic plans, filling requests from the combat zones, enunciating Signal communication's doctrines, and procedures, and handling a dozen and a half other responsibilities. What they all add up to is to see that the Signal Corps' part in this war is effective and efficient.

To carry out this function, the Plans and Operations Division is divided into several branches. They are: Theaters, Requirements Planning, Communication Liaison, Communication Coordination, Intelligence, and Operational Research. This last named branch is the subject of a separate article.

Theaters Branch

The Theaters Branch is fundamentally a liaison office between the Signal Officers of Theaters of Operations and the Chief Signal Officer. It consists of officers who represent the various fighting zones. Their mission is to see that when a theater commander requests certain supplies or personnel he gets them. With their knowledge of the general tactical situation in each theater, these liaison officers also anticipate needs.

At the same time, since these representatives are in one



Front-line scout relaying information back to command post.

office, the chief of the Branch and his executives are able to determine, when there is a conflict between two theater commanders for a limited amount of material, where the priority lies. This decision is also based on their knowledge of high strategy. They are kept up to date on these matters through their representation on the Joint Communications Board and the Combined Communications Board.

This coordination of Signal matters also applies to task forces, base commands, and defense commands. When the Signal Officer of the North African Western Task Force arrived in Washington in 1942, he had an immense amount of work to be done before that fateful D-Day in November when American soldiers stormed ashore to begin the Allied offensive that has continued to this day. He had to work out the final details of the complex communications requirements for the simultaneous landings at Casablanca, Oran, and Algiers, and to determine the specific Signal Corps troops and thousands of tons of communications equipment for shipment on the assault and supporting convoys.

The successful completion of this difficult task was aided considerably by the officers of the Theaters Branch. Under the conditions of absolute secrecy, which of necessity enveloped this operation, these Signal Corps officers provided for the activation of special troops, arranged for specialized training of Signal personnel, expedited procurement, modification, assembly, and shipping of vital equipment, and generally coordinated the activities of the Office of the Chief Signal Officer to enable it to meet the deadline.

One specific example of the details that went into this operation attracted much public attention and may be told. When the planning group of this Task Force decided it wanted a radio transmitter of the same wavelength as Radio Maroc, the then Vichy-French station in Algeria, it was up to Theaters Branch officers to see that this request was met. On five-day notice, the complete broadcasting station was procured, assembled, and installed by Signal Corps personnel on one of the battleships accompanying the invasion fleet. The seagoing station was then staffed by Signal Corps operators and maintenance men who even included a polylingual announcer.

The success of this method of reaching the military and civilian population of North Africa is well known. It was this transmitter that broadcast President Roosevelt's message to the French people, General Eisenhower's proclamation, and General Henri Honore Giraud's plea to the French military to cease resisting us.

Similar functions have been and, it is probably safe to say, are being performed for a number of other task forces and special convoys. Among those jobs performed in the recent past was a rush shipment of some 40,000 tons of signal equipment, effected entirely on the basis of an oral directive from Operations Divisions, War Department General Staff, on a single convoy for North Africa following the fall of Bizerte and Tunis. This job was followed through to the extent of having a representative of the Theaters Branch dockside to personally check the supplies onto the ships of the convoy.

Expediting urgent requests for communications supplies and insuring that Signal units are brought to full strength both in personnel and equipment prior to the departure of the task force that successfully attacked and captured the island of Attu in the Aleutians is another example of the closeness with which Theater Branch officers work with combat-bound fighting American soldiers.

Detailed estimates of Signal Corps units and equipment, which broad strategic plans of higher authority indicate will be required for operations in the principal combat areas, are prepared in Theaters Branch. Each estimate is broken down by successive zones through which the capture or recapture of enemy-occupied territory is expected to proceed and covers not only the specific types of personnel and equipment which will be needed but also the approximate dates by which units and materiel must be ready for action.

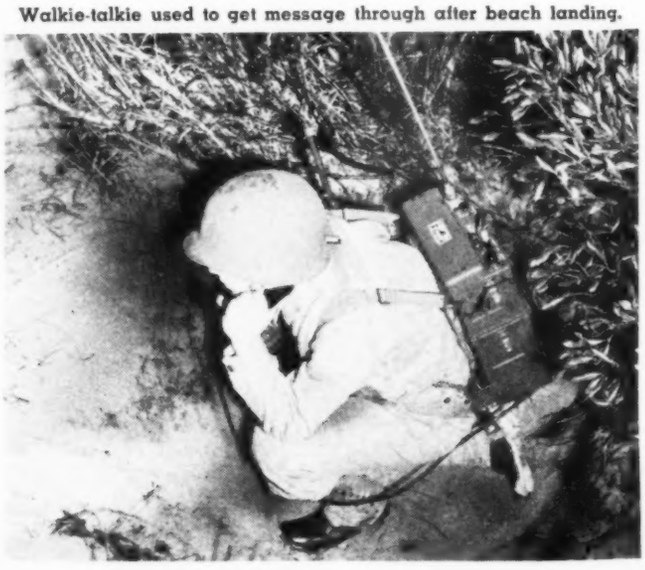
Requirements Planning Branch

The Requirements Planning Branch determines whether operational and training requirements will be met. Its job is to supervise the implementation of the decisions of Theaters Branch, both for immediate use and on a long range basis. That means that when an operation is decided upon, equipment, men, units, specialized troops and specialized materiel must be ready for D-Day. It is concerned, therefore, with training and procurement.

Runner receiving message for delivery during amphibious operations.



Walkie-talkie used to get message through after beach landing.





SCR-399 operating position. Operator uses push-to-talk microphone.



Signal Corps troops with portable hand-generator and receiver.



Stringing communication wires during landing operations.

It follows through on the activities for which it is responsible, and its officers are continually checking the progress of training and the progress in the procurement program so that men and materiel are ready when D-Day comes. Among its other jobs, it also assists the Theaters Branch in determining whether future operations can be supported. This responsibility is part of Requirements' job, since it has its fingers in the training and procurement program and thus is cognizant of the state of both programs.

This Branch is charged with preparation of Tables of Organization and Tables of Equipment for Army Service Forces Signal units. During the progress of the war it became apparent that the demands for varied communication services could no longer be met by the "type unit" organization.

Based on this knowledge Requirements Planning has set up operating teams which can handle anything from radio operating to crystal grinding. These teams can then be combined into a hand-tailored unit capable of operating any required communication system. The effectiveness of this new system has been demonstrated, time and time again, by the efficiency with which the Signal Corps has met demands for special men and material.

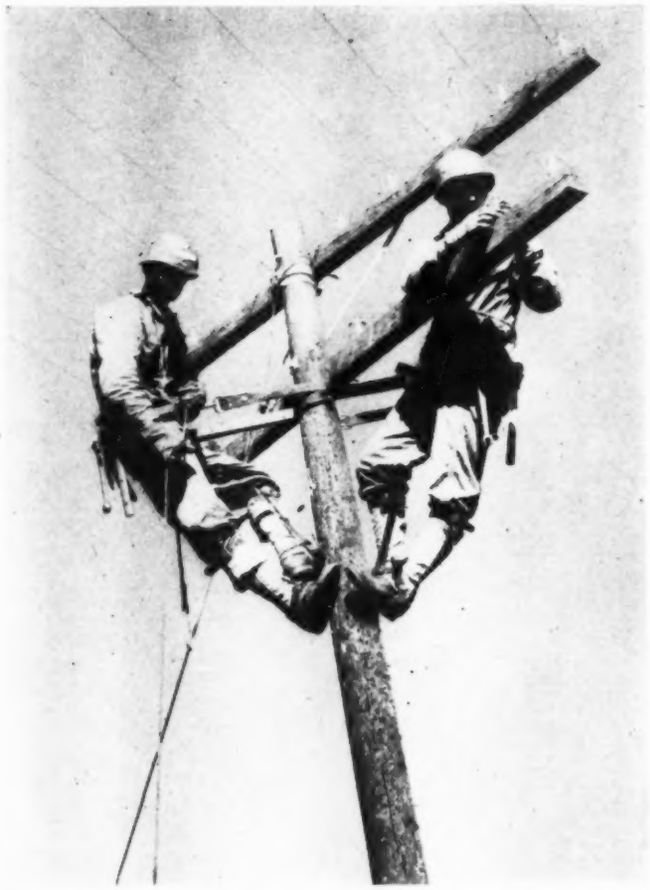
To carry out these duties, the Requirements Planning Branch maintains a file of the strengths, stations, and assignments of all Signal Corps units, and their Tables of Allowances. It also takes care of requests for Signal men and materiel from sources other than theaters of operations and defense commands. Among its other responsibilities it keeps an eye open on the assignment of Signal equipment to our Allies and others of the United Nations under Lend-Lease.

Communication Liaison Branch

The major function of the Communication Liaison Branch is to assign radio frequencies for all War Department installations and activities. To do this it must review and approve all requests and purchases for crystals and new type radios. In line with this major function, Communication Liaison also assigns tactical and international call signs for Army installations and activities operating within United States theaters. This also includes tactical call signs for all forces of the United Nations that are operating in U. S. theaters.

Another major function of C.L.B. is its position as technical advisor to War Department agencies on radio propagation matters. To do this it maintains liaison with the International Radio Propagation Laboratory. Other technical aspects of its work include maintaining liaison with the Army Air Forces concerning long distance radio communications and operating problems and with other federal agencies regarding frequency allocations, radio interference, and related matters.

Officers of C.L.B. represent the War Department on the



Signal Corps troops installing crossarms on a power-line pole. Many former Utility employees are keeping military communications open.

Inter-Department Radio Advisory Committee and other inter-departmental committees concerned with national and international radio frequency allocations. Its officers participate in the activities of the Combined Communications Board with respect to frequency and call sign allocations. Its officers also review non-government license applications for possible infringement on military needs.

As readers of *Radio News* can well understand, the number of frequencies is definitely limited. There are just so many, and they can not be stretched, bent, or stuffed with more than one channel. This is the problem C.L.B. faces in allocating frequencies. It is one that includes such considerations as: existing operations, the needs of the United States, Great Britain, Russia, the French and our other Allies, the neutrals—Spain, Argentina, Sweden; and last but not least, the propagation characteristics for the job.

The necessity to keep new radio developments within the bounds of available frequencies is a highly important responsibility of C.L.B. There is more than meets the eye in increasing the effectiveness of radio equipment, and the field of frequency allocation and radio propagation is but one aspect of this problem.

Not so long ago C.L.B. officers received a call from a port of embarkation for a frequency to be used for plane-to-ship communications. Now, normally to answer that request would have taken considerable time for it is necessary to know the type of equipment being used, the crystals which are on hand, the modifications on equipment necessary, and innumerable other facts. However, this was a rush job, and so, working far into the night, officers of C.L.B. furnished it in 48 hours by slashing red tape and running things down personally.

At another time a C.A.P. plane was forced down some miles offshore and radio communications between searching planes and C.A.P. headquarters were interrupted by interference on the safety frequency. C.A.P. officials immediately called the Communication Liaison Branch to find out what station was operating on that frequency and to ask C.L.B. to "get them off the air." The next hour saw officers of C.L.B. calling the Navy, F.C.C., and the C.A.A. in addition to checking Signal Corps stations and having Signal Corps radio direction finders take bearings on the interfering station. Within 60 minutes the cause of this disturbance was located and the station was shut down.

Signal lamp and goggles equipped with red filters to increase visibility of the blinker light during daylight hours. This equipment is used for line-of-sight communications when radio silence is essential and wire lines have not yet been laid.



Communication Coordination Branch

Communication Coordination Branch has the job of setting up standard procedures for Signal communications. On a par with this it also has the responsibility of recommending how Signal communications men and materiel shall be used—tactical doctrine. Subsidiary to this latter is its responsibility to formulate tactical doctrine and techniques for Signal units assigned to Army Service Forces.

A second major function of the Communication Coordination Branch is to follow up cases of the Communication Coordination Committee and the Signal Corps Board. These two agencies are the advisory committees on Army communications.

Highlight of Communication Coordination during the past year has been the establishment of combined operating procedures for Signal communications between the American and British forces. This is now in operation, and because of its promulgation, American Signal Corps men are able to work with the U. S. Army and Navy and the British Army, Navy, and Royal Air Force.

The importance of this amalgamation of the different practices can be seen by this simple example. At North African AFHQ it is necessary for General Eisenhower to be in contact with U. S. Army units, U. S. Navy units, British Army units, British Navy units, Royal Air Force units, and French Army components. Each of them had their own procedures in communications. Therefore it was necessary to have a British Army Signal unit take care of British Army communications, a British Air Force Signal unit take care of R.A.F. communications, a U. S. Army Signal Corps unit to take care of U. S. Army communications, a U. S. Navy unit to take care of U. S. Navy operations, a British Navy unit to take care of British Navy communications, and a French Signal group to take care of French communications.

Today only one Signal unit is necessary at AFHQ, and this unit may be entirely composed of men of one of the six services, or it may be composed of men from all six of the services, who are now all familiar with the standard operating procedures, the same in all services.

In its work on communications doctrine, officers of C.C.B.

(*Continued on page* 330)



Typical of many groups throughout our country is this cadre of the 80th Division arriving at Camp Forrest rail-head.

MILITARY PERSONNEL

The author of this article predicts an SC soldier will flash "Victory."

By Brig. General J. V. MATEJKA



Born in Texas, 1894, Graduated Univ. Texas, 1916; Army Ind. College, 1926; Signal School, 1930; Command and Genl. Staff School, 1930; Army War College, 1935. Was Assistant Signal Officer of the Panama Canal Dept., 1920; was Assistant Signal Officer, 8th Corps Area, in Office of Chief Signal Officer. Instructor in Signal School, 1930. In the Office of Assistant Secy. of War; Assigned to General Headquarters; went overseas; became Chief Signal Officer, E. T. O. and Allied Force Headquarters, North Africa, where awarded Legion of Merit. Now, Chief, Personnel and Training.

I THINK I should warn readers of this article that it is difficult to stop me when I start talking about the quality and character and performance of the military personnel of the Signal Corps.

It is natural, perhaps, that as Chief of the Personnel and Training Service, I should be inclined toward superlatives —in public, at least—when discussing the women and men under my immediate charge. And so, in order to be absolved of prejudice, I consider it important that I repeat here a general estimate of Signal Corps personnel based on experience overseas before I held my present assignment.

Reporting to the Chief Signal Officer, after a tour of duty as Chief Signal Officer of the Allied Force Headquarters in North Africa, I was proud to tell him that, from my observation and from the experience of others, it could justly be said that American signal troops in combat were maintaining the best traditions of the Corps and were supplying and operating unexcelled communications for our Army.

Whether moving with the front line elements or setting up and manning networks in less advanced echelons, the officers and men of the Signal Corps are proving their mettle and are—in the face of every destructive battle condition—getting the message through.

The Signal Corps is justly elated at the numerous awards and citations that are coming to its men from commanders in every theater of operations. We like to recall that a

(Continued on page 396)



Telephone exchange in Iceland handles 7000 calls a day.

Stringing wire for communications at our New Guinea front.



V-MAIL

The adoption of V-Mail service has reduced shipping tonnage to overseas ports.



V-Mail room at the Pentagon building. Paper reproductions are inspected and then cut into individual letters.

By Lt. Colonel E. D. SNYDER



Born in Springfield, New York, February 18, 1889. He attended Syracuse University before serving with the American Forces on the Mexican border in 1916. He served with the American Expeditionary Forces during the last war, and is the holder of the Purple Heart Decoration. He had been employed by the General Electric Company in the city of Rochester, New York, from 1920 until he was called into active service and assigned to his present position. He is now serving the U.S. Army in the capacity of the Officer in Charge of the V-Mail section, Army Pictorial Service.

THE scene is Paris, 1871.

Inside the besieged city, a fluttering pigeon, held tightly in the grasp of a man, is having something attached to its leg. The man's grasp is released with an upward fling. The pigeon wings its way over the heads of the encircling Prussians out to the French Army in the provinces.

The forerunner of V-Mail has gone out on the leg of that pigeon.

It was fitting that microfilming should make its bow to the world by air and in wartime. Crude as they were, the miniature photographs that left the French capital by pigeons, back in the dawn of photography, successfully carried to the outlying troops copies of army orders and newspapers.

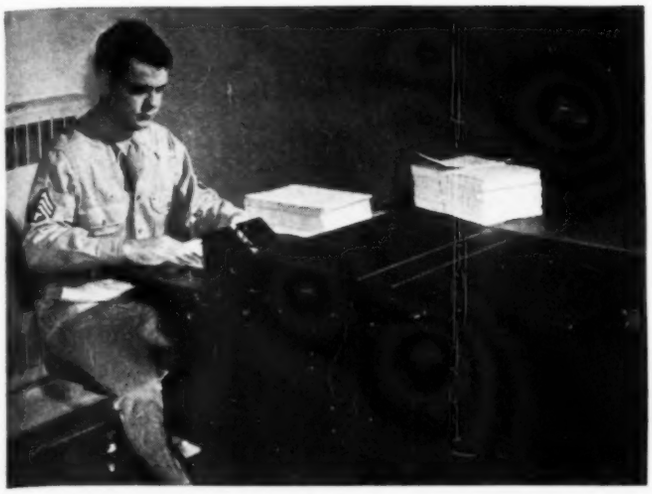
The next scene is another war, fought with weapons so much deadlier as to have staggered the most vivid imaginations of Prussians and Frenchmen alike back in Nineteenth Century Paris and on a scale so great that their war would have seemed almost a skirmish. In this war cities are besieged and obliterated from above. And men fight high over the earth's surface and below its waters and in many places across the whole wide circumference of the world at once.

Their swerving, straining lines of supply are no mere wagon trek across a continental nation but surpass the longitudes and latitudes of the earth itself.

The scattered soldiers of this war, like soldiers of all the wars before them, thirst for word from their people at home. Getting that word to them is a huge problem and an important one to their morale.

Now the scene focuses on Colonel William Rose (since Brigadier General), in charge of Army postal operations for the Adjutant General. Already, early in 1941—while the flames of war are sweeping closer and closer—he is giving thought to the task of getting mail to the Yanks garrisoning our island outposts quicker and with the least use of cargo space.

And then across Colonel Rose's desk comes a report on something the British call Airgraph, a microfilming technique developed in the United States by the Eastman Kodak Company. Begun in May, 1941, Airgraph is a process by which tons of mail of the English troops in Egypt are



Recording machine where V-Mail letters are photographed.

reduced to light and tiny parcels, flown between Cairo and London and, at their destination, transformed to readable size again for delivery.

Colonel Rose is impressed. Here may be an answer to that huge problem of moving the mail back and forth between America and America's far-flung outposts. More reports are ordered and studied. Then, in 1941, Colonel Rose recommends that a micro photographic mail service, patterned after the British system, be inaugurated.

The Signal Corps is asked to make a preliminary report on the project. Lt. Col. Kenneth B. Lambert (then Major) examines equipment and blueprints and every possible device that will handle what he is already certain will be a tremendous volume of filmed mail. Finally from a welter of figures he compiles the estimated cost of the project and on September 20, 1941, he submits his recommendations for the appropriations, personnel, and operation.

Postal Inspectors C. L. Williams and William A. Kenyon (both now colonels in the Army) and Inspector W. J. Means conduct experiments with a Recordak used for photographing records in the Washington Post Office Department and all rights to Airgraph are granted the Army by the Airgraph Corporation.

As difficulties are ironed out and the Army Micro Photographic Mail Service approaches reality, one detail still bothers Inspector Williams. He doesn't like that ponderous title waiting to be hung around the neck of the as yet unborn baby of the mails.

It should, he feels, have a name emblematic of the times, short and streamlined to typify the swift compactness of the service itself. He evolves the name "Victory Mail" and submits it to his colleagues.

"Why not just V-Mail?" Captain R. K. Awtrey, U.S.N. Retired, inquires. "After the words we could use the notes symbolic of the V sign from Beethoven's Fifth Symphony."

"Better than that," another suggests. "Instead of a hyphen between the V and the Mail we could have the Morse code for V!"

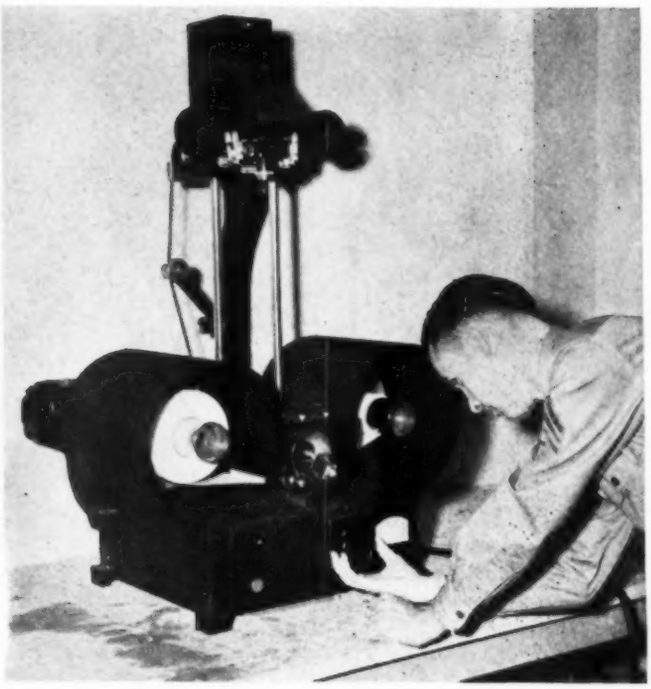
So the official name became V ···— Mail.

The Signal Corps was given the job of processing V-Mail for the Army and a large part of the Navy. That has turned out to be a big job and it's getting bigger every day. At this writing, the volume of V-Mail has increased 400 per cent since January 1, 1943. That means over 25,000,000 V-Mail letters a month.

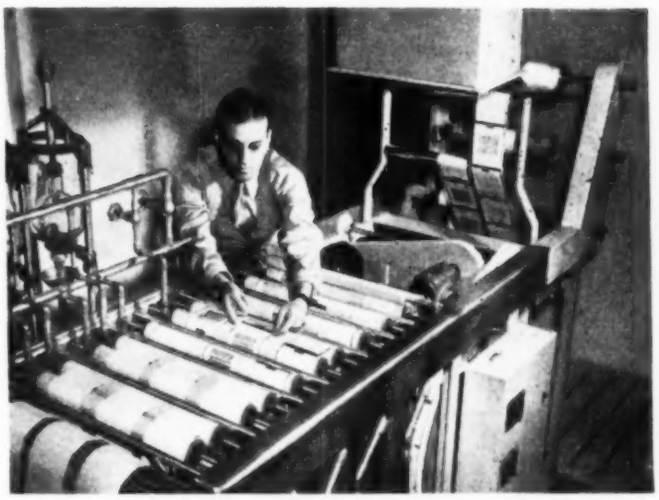
It may seem a far-fetched statement to say that V-Mail is shortening the war and thereby saving the lives of countless American soldiers, but the connection can very easily be demonstrated— All military experts agree that only offensives will bring this war to a successful conclusion for us. Beginning and maintaining of these offensives are dependent on shipping, on the staggering task of transporting millions of tons of men and materiel all over the face of the globe.

Now all one has to do is consider the fact that each

(*Continued on page* 428)

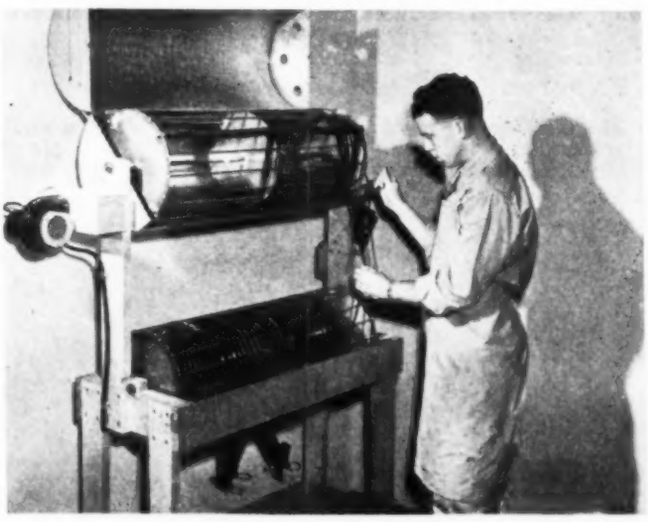


Continuous enlarger where films are reproduced to normal size.



Developing, fixing, and drying V-Mail letters on processing machine.

Films being developed. After drying they are sent in compact groups.





U. S. Signal Corps cameraman. The Army trains expert combat photographers so that the war can be recorded on film for intelligence and tactical study.



Signal Corps troops operating a beach signal station. Coded signals are used.



Photographic view showing elaborate pole line installations on New Caledonia.

Training Army PHOTOGRAPHERS

By Captain ARTHUR C. GASKILL

Experts teach men of the Corps the art of taking both still and sound pictures. Basic study course lasts twelve weeks.

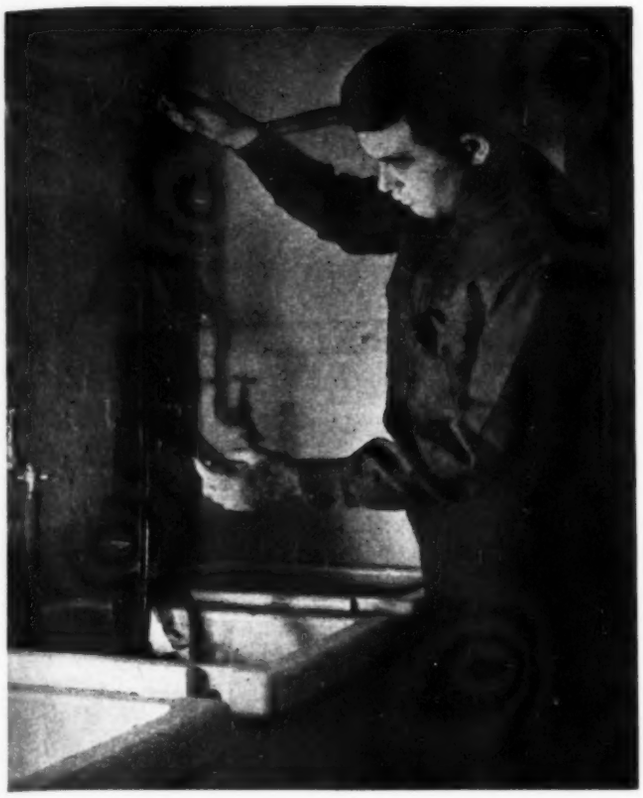
IN ORDER to put the war on film for the record, newsreels, and newspapers and for intelligence and tactical study—the Army trains expert combat photographers and motion picture cameramen.

At the Signal Corps Photographic Center, at Long Island City, N. Y., there is a fully equipped and expertly staffed Training Division which teaches soldiers the art of combat photography.

The men in the school have some civilian photographic background of one type or other and many of them were affiliated with newspapers all over the United States. In the school they are taught what pictures the Army needs and wants, and how to get them under difficulties presented by battle conditions and by the elements. They are taught the mechanics and the general principles involved in the care and use of every type camera used by the Army. At the same time, the student photographers are taught to fight and to protect themselves from enemy action.

The course of study lasts for twelve weeks. All students, assigned to the Training Division, spend two weeks in a basic school, where, for two hours per week, they attend what is called an orientation course. In this class, they are indoctrinated with their mission on the battlefield in the prosecution of the war. The instructors, through interviews, quizzes, and questionnaires, learn the background of each man. The employment record of each student is studied, as is his educational and recreational background. The information gathered by the instructors in this way, helps them later to decide what, if any, is going to be the student's specialization.

(*Continued on page* 270)



Processing film-pack negatives in the laboratory of an American Pictorial Service unit somewhere in England.

ARMY PICTORIAL IN ETO

By Col. WILLIAM W. JERVEY



Born December 22, 1897 in Chicago, and was graduated from the U. S. Military Academy in 1918; the Cavalry School, 1920, and the Signal School, 1929. Served in the Signal Corps Photo Laboratory, 1931-35, and was a student at Academy of Motion Picture Arts and Sciences, Hollywood, Calif., 1937-38. Was Officer in Charge, Signal Corps Photographic Laboratory, 1939-1940; Assistant Officer in Charge, Photographic Division, Office of Chief Signal Officer. Became Executive Officer during 1941-42. At this time, he is Photographic Officer, ETO.

Taking action shots under fire is but an "assignment" for Army photographers.

THIRTY days after the infamous attack on Pearl Harbor, a detachment of seven men, weighted down by field photographer's kits in addition to their regular GI equipment, boarded an oil freighter loaded with high explosives and set sail for North Ireland.

This group of one officer and six enlisted men was the initial contingent of photographers that eventually was to become the Army Pictorial Service in the European Theater of Operations.

Their first darkroom at Headquarters, ETO, was a basement kitchen with tar paper tacked over the windows. The only water supply issued from a battered old kitchen sink.

The mounting demands of the war effort soon made it necessary for the personnel to be greatly expanded, along with many additions of newer equipment and an ever increasing flow of supplies, until today the base laboratory and headquarters of the Army Pictorial Service in the ETO occupies nearly all the floor space of two office buildings in a United Kingdom city.

Instead of the seven men in the original detachment, the APS today consists of certain Photo Units and Mobile Photo Laboratory Units and headquarters staffs that comprise hundreds of trained technicians, photographers, and administrative personnel.

The present work is far different from what it was when the first detachment set to work. When returning from assignments it was not infrequent for them to be met at the station by 1st Lt. Eric Marquardt, the detachment commander, with a new supply of films and orders to another distant coverage. But today the well-trained staff and efficient organization make it possible for the APS to give complete coverage in the ETO.

Pictorial coverage of news is only one phase of the APS work. Film production and distribution occupy essential niches in its activities. Many intelligence reports are sup-

(*Continued on page* 258)



Drying and classifying finished prints in the laboratory.

Operating two 16 mm. movie-film processing machines.



ARMY PICTORIAL

Army photographers are among the best in the world. They cover every battle.

By Col. KIRKE B. LAWTON



Born in Athol, Mass., November 3, 1894. Has a B. S. degree from Worcester Polytechnic Institute, 1917; graduated Signal School, 1925. Was assigned the post of Corozal, C. Z., as C. O. of the 10th Signal Co. and Acting Signal Officer, Panama C. Z. Became secretary of the Signal School, 1929-31; instructor of the Massachusetts National Guard at Boston, 1931-36; instructor at Reserve Officers Training Corps at M.I.T., 1936-40, and was with War Plans and Training Division, 1940-41. Was appointed Chief, Army Pictorial Service, 1942.

Signal Corps cameraman somewhere in French North Africa.





Giant contact printer used for reproducing blueprints.

AS YOU read this magazine, you may be sure that somewhere crouched in a foxhole, is a U. S. Army Signal Corps photographer, popping up between shell bursts to shoot a picture; that somewhere else another is probably unslinging a hot-barreled carbine as he temporarily discards his camera; that in another part of the world a helmeted soldier is cursing the quivering ground beneath his feet as he tries to steady his overworked Graphic for more action stuff.

In every theater of this global war, wherever the action is hottest and the fighting fiercest, will be found the camera crews of the Army Pictorial Service. They are the eyes of the War Department at Washington, sending back a visual realistic record of the fighting on every front.

To a great extent, they are the eyes of the American public, too. Try to conceive of how hazy and bewildered your own ideas of this war would be if you had never seen a picture of combat, of troops in action, of the devastation and destruction, of all the phases of warfare that the camera has clearly laid before you. Many, if not most, of those pictures, both still and motion, bear the familiar label, "By U. S. Army Signal Corps."

Every day and night men of the Army Pictorial Service are risking—and giving—their lives to bring you this graphic history and to send back the pictorial records on which our future tactics so often depend.

A glance at a few excerpts from the reports of Army photographic units in the combat zones will give you some idea of the difficulties that beset them:

"We have been in every major battle over here since . . . from mountain and green slopes to the sands of the desert and oasis. . . . One man who is missing in action . . ."

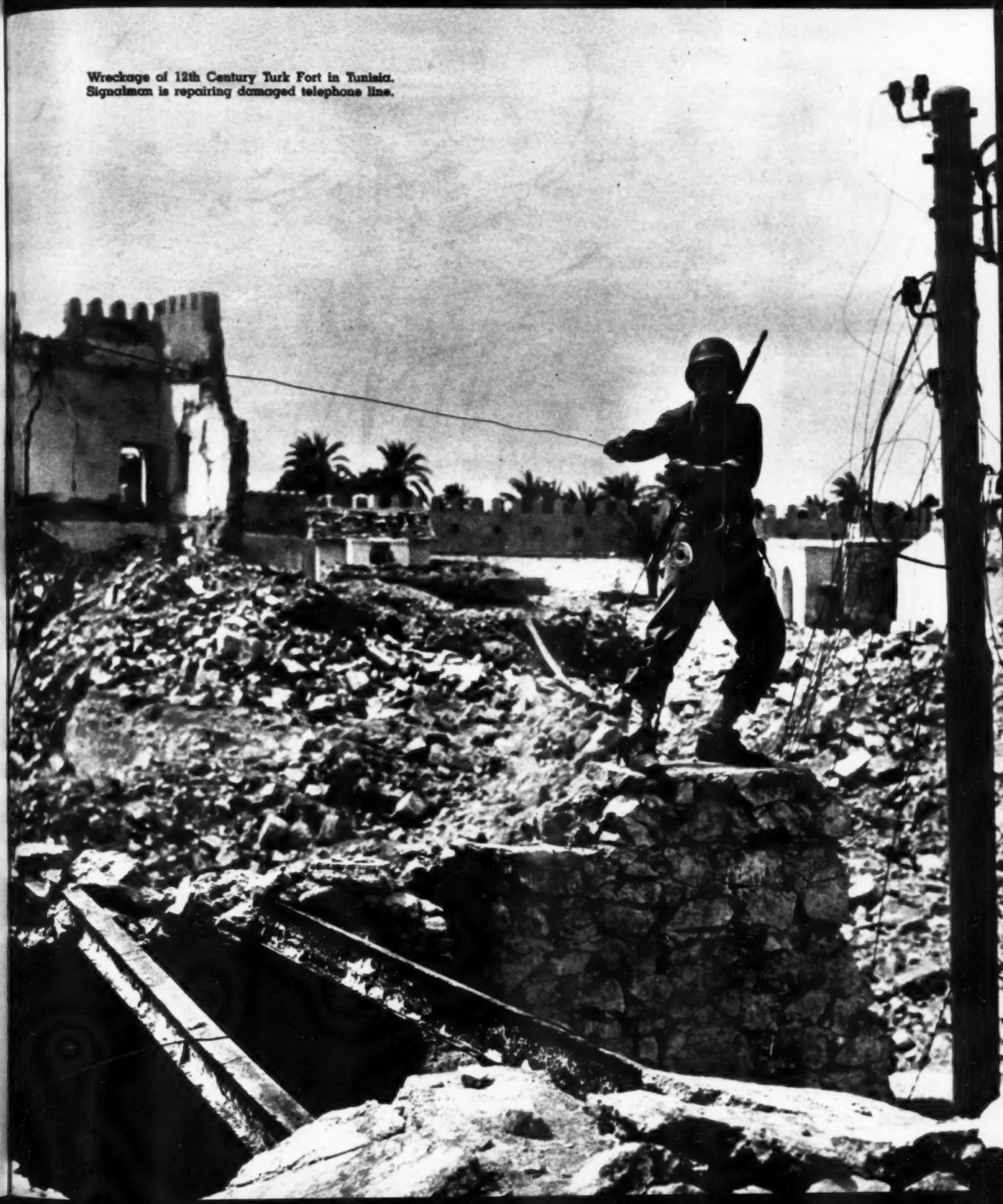
"Some of us ran into trouble . . . searchlights, machine gun fire. . . . Some of the boats turned over in the surf while others sank with just too many holes from .50 calibre machine gun fire. I was in such a boat and had to swim in with my camera equipment on my back."

"We didn't have to go in on the first four assault waves but my men volunteered and insisted."

(*Continued on page* 147)

OVERSEAS PICTORIAL

Signal Corps Photographers are in every major battle, on every front—shooting a graphic record of our global war



Wreckage of 12th Century Turk Fort in Tunisia. Signalman is repairing damaged telephone line.


NORTH AFRICA



American personnel give instructions on American radio equipment to French communications officers at a class held near Algiers.



American main Signal Station. Regimental radio in ditched position located back from beach at Les Andalouses, Algeria.



Cpl. Milton Theodore, Signal Battalion man repairing damaged lines somewhere in the North African Theatre of Operations.



U.S. Signal Corps troops set up a telephone switchboard immediately following the Allied capture of Bizerte, North Africa.



Center of Caltanissetta with Signal Corps men of the 45th Div. setting up wire installations. Note wire reel on American Jeep.

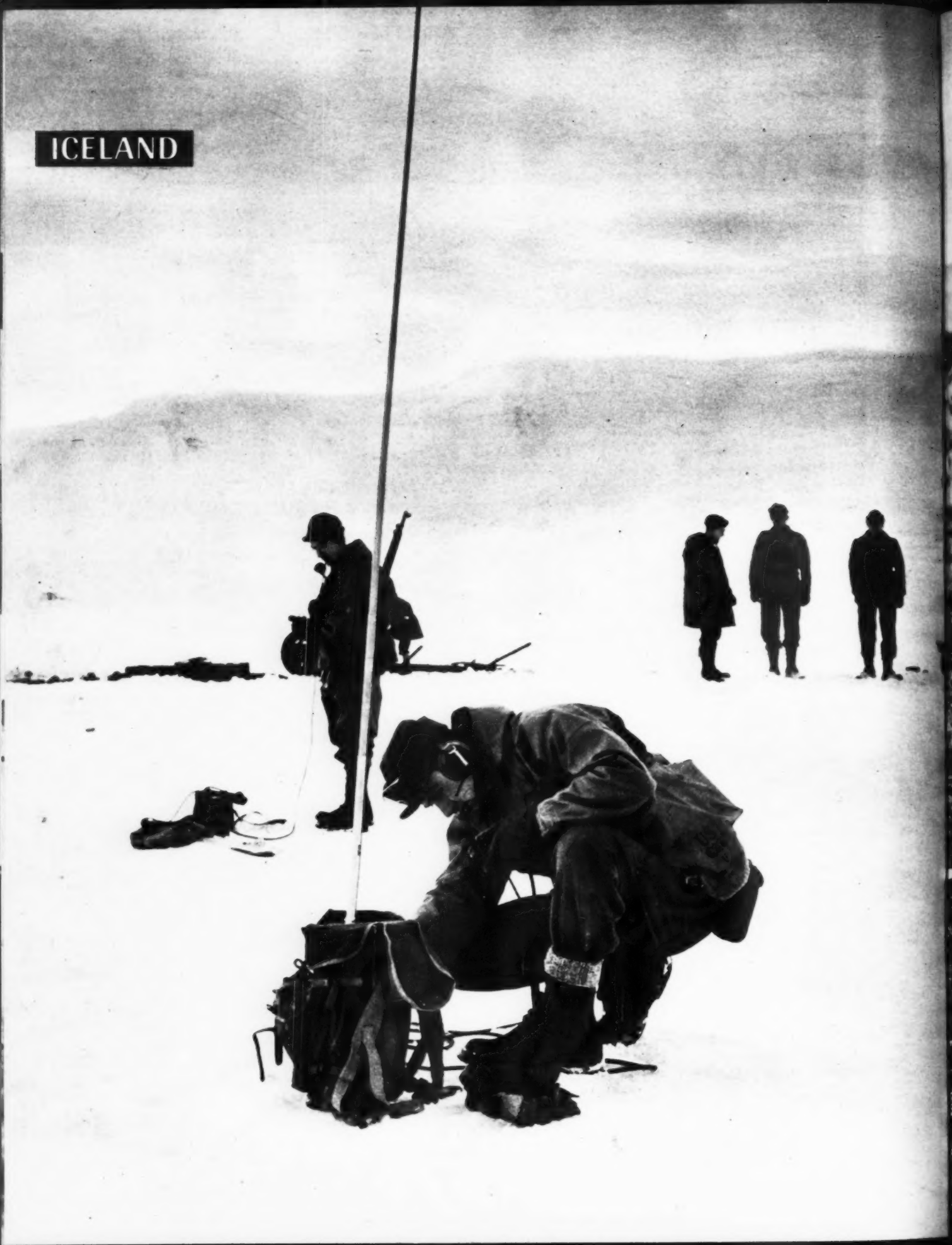


American Jeep, radio equipped, together with other equipment just landed at an Alaskan base after Japs were driven out.

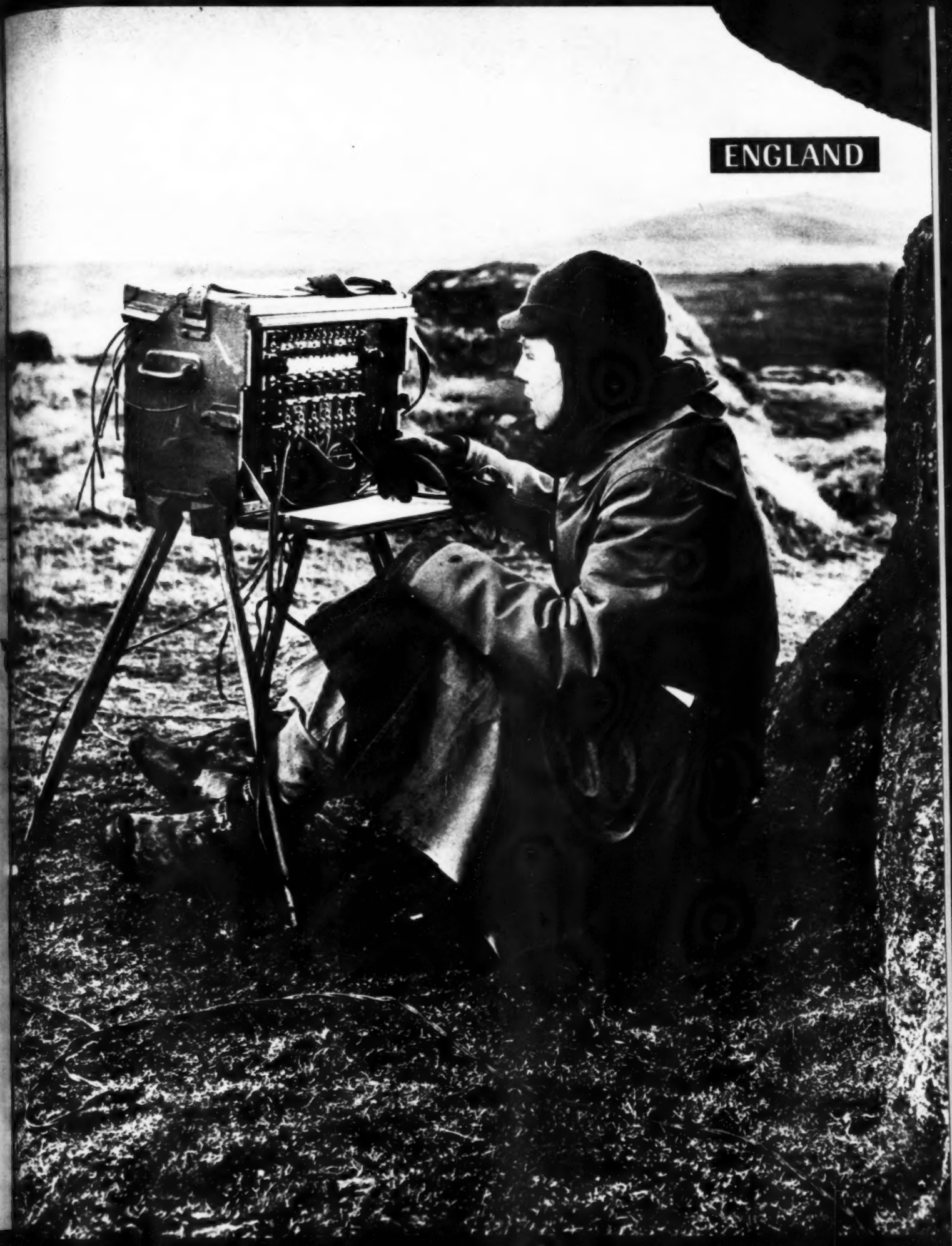


Radios, telephone equipment and accessories complement this Jeep somewhere in the Alaskan Theatre. Note heavy tire chains.

ICELAND



The highly efficient "Walkie Talkie" two-way Radio in communications between our observation posts and the firing line.



Cpl. William Halstead, Norfolk, Va., at field switchboard receiving orders from observation post of an Artillery range.



American soldiers are here shown receiving firing orders from observation post somewhere in the Australian Theatre.



Over unusually tough terrain thousands of miles of telephone lines have been constructed by American troops in Australia.

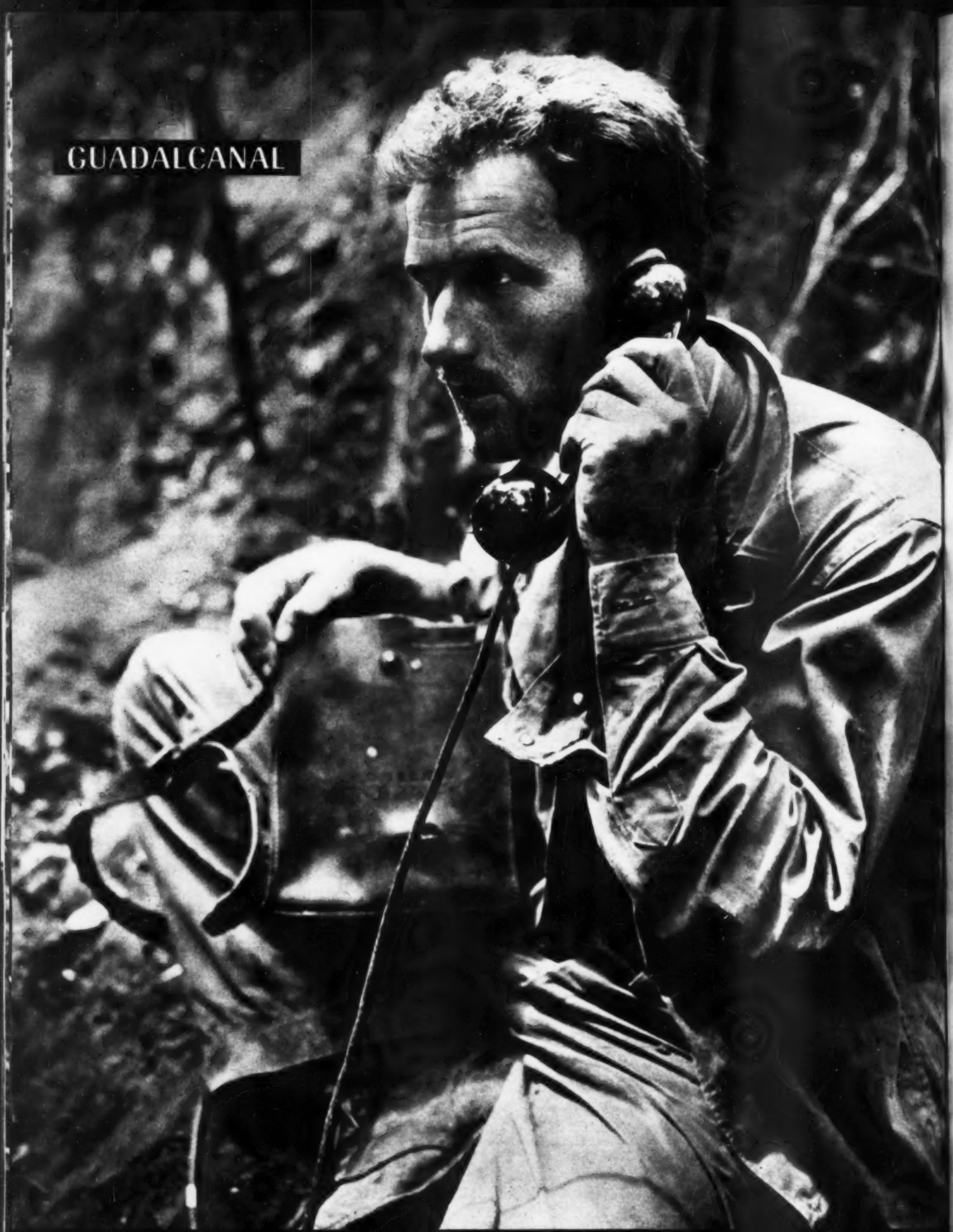


Telephone communications play a vital part between artillery batteries and the directors. Such equipment is very delicate.



Pfc. Edward C. Griser operating the BD 72, 12 drop switchboard in a communications dugout somewhere in New Guinea.

GUADALCANAL



Pvt. Edwin J. Yanushkis holding the phone which was hit by shrapnel when a Japanese knee mortar landed six feet away.

(*Continued from page* 130)

"One corporal photographer led a group of infantry to the rear of a fort, where they knocked out a machine gun nest."

"One corporal photographer was the fourth American to land on African soil, going in with . . . to the very mouth of the French guns. He helped take prisoners and captured a small cannon."

"One sergeant was so anxious to get head-on shots of our advance that he was caught in our own barrage, but he got his pictures of the taking of the fort."

• "We have had to scale cliffs and follow goat trails six to seven miles for pictures."

"The enemy hates photographers, we have found by quite a few close calls. Thus a musette bag with extra film, his cameras and rifle make up the photographer's combat equipment. There are times when you have to shoot your way out."

"We learned to keep our cameras out of the sun, particularly the desert sun; they get so hot we can hardly hold them and there is damage to the film."

"We have to walk, stalk, and crawl on our bellies to get a closeup."

"The boys have stuck their necks out plenty to keep up with the continuity . . . and in most cases have been fired upon by machine guns, rifles and the inevitable 88's . . . until everyone of them have what we call up here at the front 'eighty-eightitis'. . . . You don't see them, you don't hear them . . . then whoosh, there they are right in the middle of your area, and everybody has to duck."

". . . Three cameras shot out of my men's hands."

". . . One of my boys receiving the Silver Star for gallantry in action."

From dangers and difficulties such as these—and they are the merest sampling—have come such epic records as "Report from the Aleutians," "At the Front" in the Tunisian campaign, and thousands of still and motion picture scenes of American troops and America's war-time leaders in all phases of their activities the world over.

But these pictures you have seen are only a small portion of the job of the Army Pictorial Service. Every morning in a projection room in the War Department's Pentagon Building in Washington will be found one of the most select, and probably the most rapt, motion picture audiences in America.

They are the representative officers of every arm and service of the Army and of the Navy, Marines, and Coast Guard. The motion pictures they are watching are the daily receipts from the various theaters of operation.

On the desk before each officer is a push button and a red light. The button controls a device developed by the Army Pictorial Service to meet the unique demands of this audience. As there flashes on the screen a sequence that will be of interest to any particular branch, its representative officer pushes the button. The red light goes on. As long as that light is on, a tape that is synchronized with the film is making a notation of the fact that the portion of film being shown at that time is of particular interest to that Branch.

When the showing is over, copies of the parts in which each officer has shown an interest are made for his branch, to be used for study in detail, for training, for correction of errors, for improvement in technique, and tactical lessons.

Likewise, the still pictures that pour into Army Pictorial

(*Continued on page* 312)

Giant photostat machine at Fort Monmouth Signal Laboratory. Operator shown adjusting camera prior to operation.



SIGNAL CORPS in the

The part that Signal troops play in winning this war.

EDITOR'S NOTE—The first elements of the Signal Corps arrived in the European Theater of Operations in the summer of 1942 with a lot of plans and a full appreciation of the magnitude and importance of their task. Officers and men quickly adapted themselves to British customs, materiels, and weather, and the results of their work were soon evident in the form of vast supply depots dispersed over the English country-side and busy networks of telephone, teletypewriter and radio stations handling astronomical numbers of code messages daily.

The intimate cooperation of the British people—military and civilian personnel alike—was from the start 100% perfect, and contributed in no small way to the accomplishment of the dual mission of providing complex communication facilities for numerous large and small headquarters and also signal supply service for a large army and a large air force. The first test of these facilities and services came during the planning and the subsequent execution of the landing operations in North Africa in the fall of 1942, hardly six months after the arrival of our main forces in the European Theater of Operations. That the Signal Corps, as well as all other arms and services, met the test is now a matter of history.

The restrictions of military censorship prevent the telling at this time of the full technical story. However, the specially-written articles that follow, with their accompanying illustrations, will give the readers of "Radio News" at least a general picture of what is transpiring in many of our foreign war theaters.

By Brig. Gen.
WILLIAM S. RUMBOUGH



Born in Virginia, 1892. Joined Nt. Guards, 1916. Reg. Army, 1917. Trained recruits in France, 1918. Prof. Military Science & Tactics, Univ. Illinois, 1920. Graduated Signal School, assigned Office of Chief Signal Officer, 1925. B.S. from George Washington Univ., 1927. Graduated Command & Genl. Staff School, 1931. Graduated Army War College, appointed Major, Director of Dept. of Communication Engineering, Signal School, 1934. Became Hawaiian Div. Signal Officer & Brig. Genl.; Com. Officer at Crowder. Chief Signal Officer, European Theater of Operations.

TODAY'S invasion army is tied together with threads of wire. Hundreds of miles of wire and innumerable radio nets form a vast communications network over beaches and mountains and streams, linking all units, coordinating the attack.

It is the mission of the United States Army Signal Corps to weave this vital web with one hand, while fighting off the enemy with the other.

When the U. S. Fifth Army struck Italy, General Mark Clark was able to direct first-hour operations from the deck of his command vessel in Salerno Gulf because Signal

Members of U. S. Aviation Engineers building shelters near air field in Youks Les Bains, North Africa. SCR-299 on right.



EUROPEAN THEATER

The saga of communications on our fighting fronts.

Corps soldiers landed first under fire and fought their way up the enemy's beaches toting "walkie-talkies"—portable sending and receiving radio sets. Amphibious two and a half ton trucks—called "Ducks"—carrying complete radio stations lumbered ashore immediately afterward to extend communications to point off the continent.

One of the first complete companies to go ashore, in the assault wave, was a Signal Corps unit. They clung precariously to the beachhead and wired in a lateral communications net between supply dumps. Through days and nights of almost continuous bombing, strafing, and artillery fire, these men kept their lines in operation, uniting advance elements, shore depots, and off-shore convoys. They are still there, ever extending. Their tireless efforts have helped make possible the tremendous stream of supplies and equipment that is pouring ashore to keep the Fifth Army dangerous and fed as it advances out over Italy.

The speed and movement of modern warfare calls for extreme coordination, especially during the early hours of an amphibious landing. Every unit must know just what the other members of the offensive team are doing minute by minute, if the attack is to succeed. The only answer to that problem is a reliable communications system, beginning from the time the entire assault force is waterborne, right through the landing and extending, to the most advanced outpost ashore. Deemed most critical is the 12-hour period immediately following the moment the first wave steps onto the beachhead.

A dramatic phase of the Italian invasion was the work of the Signal Corps in establishing and maintaining initial communications between the U. S. forces and the British elements attached to the Fifth, which had effected landings on separate beaches. The unit credited for this hazardous operation was commanded by Lieutenant Colonel Frederick C. Lough, of Fall River, Mass. His men piloted one of the huge radio "Ducks" over bombed and shell-torn roads right up to the enemy's lines, made perfect contact with the British headquarters, then dared the Germans to split the Allies' connecting link!

For fourteen consecutive hours Jerry shelled, bombed, and strafed the vital Signal installation. The men merely dug deeper foxholes and dared him to try again. Ultimately Fifth Army infantrymen pushed the Germans out of their dangerously close positions, the punishment eased and the Allies were permanently united by the circuit.

French equipment being evacuated during Kasserine Pass action, at which time the American troops were forced to retreat.



Signalmen instantly set out to open more secure channels of communications between the two forward prongs. At this stage of the landing, the Germans were never more than four miles from the shoreline, creating a narrow corridor in which the two forces were confined. A signal crew, under the direction of Lieutenant Edward L. Haynes, of Lubbock, Texas, and assisted by Technical Sergeants Robert Mozley, of Lithia Springs, Georgia, and Lawrence E. Savage, of Malone, Texas, was dispatched to lay lines through this "hot alley."

This gang laid their precious thread of wire for 15 miles over rocky hills and through strange country under the very noses of the Germans. They ducked in and out of slit trenches by day and worked in the light of bomb flares by night. But the line went in.

"That was just the beginning of our job, not the end," said a crew chief, Sergeant William E. Black, of Dadeville, Alabama. "They fought a stiff battle right over our line and cut it almost as fast as we could repair—almost but not quite."

Another crew head, Sergeant Odies R. Dorrell, of Morrilton, Arkansas, kept a record of the breaks during the battle to keep 'em talking. His report revealed the line was sliced eleven times by enemy shell-fire alone. With each break, expert crews moved out under fire, sometimes in complete darkness, to effect repair.

Private First Class Leonard E. Revier, of North Field, Minnesota, and Private Walter H. Gray, of Crane, Missouri, themselves worked as a complete two-day circuit. Special messengers between the two forces, they drove their motorcycles day and night over dangerous roads, around road blocks and demolitions, to carry important papers and information between the headquarters. So tortuous was their route along back roads and over detours that their round trip totaled 52 miles.

"We had to make time," Revier said between trips, "in order to get back in time to start out again. I got up to 60, once, when that whistling 88 struck barely 40 yards behind me."

Gray was soon sold on his Allies. "Those British Tommies not only gave me a cup of hot tea, at the end of my trip to them, but a slit trench, as well, to drink it in. That's what I call true hospitality."

As the British Eighth Army, under General Bernard Law Montgomery, moved north on the eastern half of the

(*Continued on page* 384)

American Officer showing French Soldier the operation of a communications receiver, near Algiers, North Africa.





Members of American tank crew in field uniforms, prior to an Allied offensive in North Africa.

MEDITERRANEAN

Radio communications played a vital role in winning our recent victories.

By Colonel DAVID E. WASHBURN



Born in Nebraska, 1890. Was with Northwest Bell Telephone Co.; served with AEF; holder of Purple Heart. Graduated Signal School, 1928; instructed at Signal School, 1923-28. Signal Officer, Pacific Sector, Panama Canal Zone; instructor, New York Nt. Guard. Acting Director, Signal Corps Laboratories, 1930-40. Officer in Charge, Ground and Vehicular Equipment Section, Research & Development Division, Office of Chief Signal Officer. Signal Officer, U. S. North African Military Mission, 1941-42. Present duty is the Executive Officer, Office of the Chief Signal Officer.



Engineers clearing mines from Salerno beach to insure safe passage for the American Fifth Army when they stormed ashore.

"THE victory is of your making, too, and its fame and its glory belong to each of you."

The speaker is General Sir Harold R. L. G. Alexander, deputy commander to General Dwight D. Eisenhower and in charge of all land operations by the United Nations forces in North Africa. His audience is five hundred officers and men of the United States Signal Corps.

Thus was summarized the Signal Corps' thrill-packed role in the North African campaign which made possible the invasions of Sicily and Italy. Signalmen proved their versatility by fighting with the infantry to establish beachheads, by shooting down planes, and by clearing mine fields, and—above all—by establishing and maintaining the main arteries of signal communications throughout the battle areas, sometimes under strafing and heavy bombardment.

The story of the Signal Corps in the Mediterranean Area begins, however, long before the initial invasion, even before the plans for campaigns in this area had begun to crystallize. For months, while the British were engaged in a see-saw battle with the Germans and Italians across the Egyptian and Libyan deserts, the Signal Corps tested apparatus and equipment under a variety of atmospheric and climatic conditions to insure an adequate performance when the United States was ready to hurl its power into the fray.

As a result of these tests, special adaptations of the equipment were made before the start of ultra-secret preparations in England for the historic mass effort to



Acme Photo

Gun crew of a self-propelled 75-mm. cannon on half-trac, awaiting orders to advance in Troina, Sicily.

throw the Axis out of the African theater of operations.

High-ranking officers led by Brigadier General J. V. Matejka, Signal Corps Officer on General Eisenhower's staff, and Brigadier General W. S. Rumbough, in charge of signal supply activities in Europe, directed the advance planning of signal systems and the training of Signal Corps units for the delicate and well-timed invasion operation.

This was no small problem. The establishment of wire and radio communications to and within the landing forces was only the start of the project. Of vital importance was the maintenance of reliable signal communication channels and circuits to each task force and between adjacent task forces which were to land along the African shore lines of the Atlantic and Mediterranean. Constant communications had to be maintained with the supporting aircraft and with the bombardment aircraft squadrons. In addition, signal communication channels were necessary for the direction of the naval gunfire support and between the combat commands on shore and their superior commands afloat.

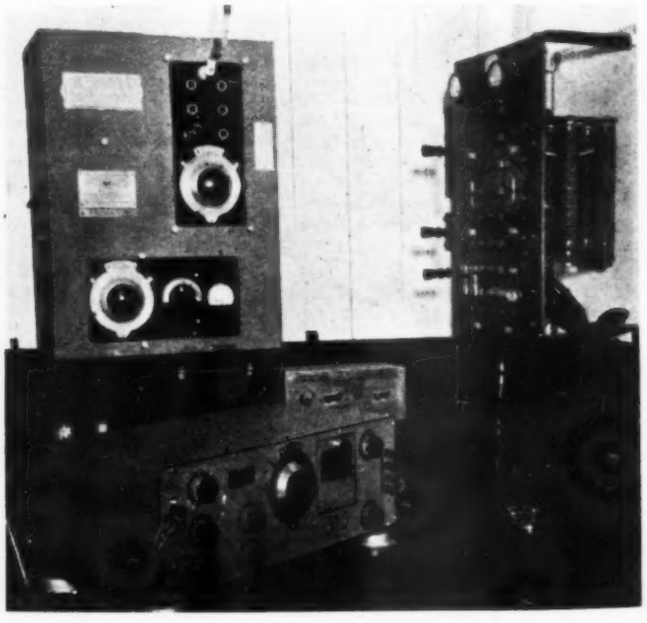
The Signal Corps established a system that would permit a flow of information between all major elements of

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Soldiers laying wire for communications in African desert.



Emergency radio equipment aboard an Allied transport.





PACIFIC THEATER

Battery-charging section of a Signal Repair Company located in New Guinea.

By Lt. Colonel
CHARLES J. McINTYRE



Born in Philadelphia, 1895; graduated with B.S. degree from U. of Pennsylvania, 1916; U. of Paris, 1919; and did graduate work at Temple U., 1936-7. Graduated School of The Line, 1917, and Infantry School, Company Commanders Course, 1921. Served with 3rd Div., AEF, and Army of Occupation; is holder of the Purple Heart. Was with Bell Telephone Co., 1922-28; taught modern languages at St. Joseph's College, 1928-34; and was Pres. and Director of Camp Lafayette, Inc., 1928-40, when called to active duty. Assigned Chief, Special Activities Branch, late in 1941.

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Reports from the Pacific Theater tell of the heroic accomplishments of Signal troops engaged in combat.

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AMERICAN landing barges crunch onto the sand of New Georgia Island. Out swarm the Infantry—and the Signal Corps—splashing through the surf and on to the shore.

As the Japanese open fire the Infantry crashes into the brush while the Signal Corps men don leg irons and climb trees.

There the Signal men string the wire connecting division and task force headquarters—opening vital communications for the mission.

With bullets whizzing through the palm fronds about them, the wiremen work as calmly as though doing a job along U. S. Highway No. 1. That is a sample—extracted from an Associated Press eyewitness account of actual operations last August—of the job the Signal Corps is doing wherever the going is toughest throughout the Pacific area.

The Signal Corps accepts such incidents as a part of the day's work, normally unspectacular but tremendously important, nevertheless, in the tortuous task—against terrific obstacles—of wresting territory from the Japanese Empire.

The first warning of the Pearl Harbor attack that plunged us into war came from the Signal Corps. Joseph L. Lockard, who later earned an officer's commission, spotted the first Japanese planes with the aircraft detector unit he was manning December 7, 1941, and subsequently was awarded the Distinguished Service Medal for his feat.

Immediately, the Signal Corps pitched in to meet Army



Message center "op" uses phone to transmit important information.



Operational Headquarters at the front during Munda campaign.

communication requirements that overnight had increased a thousandfold.

Over in the Philippines, Brig. Gen. Spencer B. Akin, as Signal Officer for General Douglas B. MacArthur, hastily organized emergency units from the limited number of qualified men available and set up a system that was able to maintain communications continuously to all echelons of command, despite heavy shell fire and bombardment.

"He contributed immeasurably to the success of operations during this period," read a War Department citation in which General Akin was awarded the Distinguished Service Medal. General Akin went with General MacArthur to Australia and again was decorated, this time with the Silver Star for gallantry in action near Buna, New Guinea, on December 23, 1942. The Signal Officer was on reconnaissance in an advanced zone where a strategic bridge leading to an airfield was being repaired for American troops to advance under fire from Japanese snipers.

"General Akin aided in reorganizing a platoon which had been under severe enemy fire," read the citation. "He then crossed the bridge IN ADVANCE OF THE INFANTRY and spurred them into attack which eventually led to the capture of the airfield."

Day in and day out, however, hard work and ingenuity are the keywords as Signals Corps men expand the vast facilities needed to coordinate war efforts in the far-flung Pacific Islands. Time and again they meet obstacles of weather, terrain, and jungle that at first seem insurmountable, only to be conquered by perseverance. The entire continent of Australia, as big as the United States, had to be organized as a base for operations through the Pacific islands on the road to Tokyo.

The remnants of one Signal battalion and very little equipment were available at the start. Australia had a communications system but it was not very extensive and was terribly overloaded.

Without hesitation, the Signal Corps went to work.

"One job we had to get done," said Major A. E. Wharton after a tour of the area, "the Australians gave us an estimate of six months to complete. Our boys did it in six weeks—strung the auxiliary wires on poles already in place."

Termites destroyed wooden poles; the Signal Corps promptly erected steel telephone standards. Everywhere the men took advantage of any existing facilities and devised substitutes on the spot when regulation equipment was lacking.

The problem of supply itself was immense. Huge depots were set up, then moved to more appropriate locations. Streams of materiel began moving forward as the system expanded and new equipment replaced the makeshift installations necessary at first in some places.

Progress on the neighboring islands was particularly difficult.

"The jungles," said Major Wharton, "are just plain hell for the men to work through. A lot of time they're lucky if they can get through the undergrowth with a trail of wire—no question of stringing it, and of course no underground cable.

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Telephone operator maintaining communications with front line.



SCR-299 radio unit in operation deep in the Munda jungle.



ALASKAN THEATER



Constructing communication lines—a rather difficult task, considering the rugged Alaskan terrain.

Maintaining communications at Attu was most difficult. The Japs preyed on our wire lines—slashing them with bayonets.

By 1st Lt. MACY M. CAROTHERS



Born at Ekin, Indiana, January 25, 1900, and served with the AEF and Army of Occupation in World War I. In 1920 he joined the staff of the Columbus, Ohio, Dispatch, serving successively as news reporter, radio, promotion and state editor until 1938. The next four years he was in Government information work in Ohio and also served as Editor of the American Legion newspaper. He entered the service in 1942 and was graduated from the O.C.S., Fort Monmouth, New Jersey in 1943. He was assigned to the Special Activities Branch on April 9, 1943.

UP IN the vast frozen frontier of Alaska and out along the eerie fog-bound Aleutians, the Signal Corps has done its part in protecting the United States from invasion by the little men from Japan.

Even while achieving feats of Paul Bunyanish proportions to criss-cross Alaska itself with adequate lines of communication, Signal men were participating actively in chasing the Japs out of the Aleutian Islands where they had entrenched themselves shortly after Pearl Harbor.

First came weeks that stretched into months of grueling, unspectacular, behind-the-scenes work which made possible the bombings that softened the tenacious Jap defenders for land attacks. Then came Attu, and the bloody business of dislodging a stubborn, fanatic foe from that barren, mountainous island. With the American landing forces, of course, went the Signal Corps to install radio stations, lay telephones, telegraph lines, and otherwise attend to the usual duties of communications.

Naturally, there was trouble. The occupation was accomplished under extremely difficult conditions of heavy fog and rain which reduced the tundra to a quagmire and made the use of vehicles impossible. All equipment had to be transported by manpower and in freezing weather. The miserable dampness caused corrosion and short-circuits



Portable radio station with antenna mast shown in right background. Trailer and power truck make up the complete unit.

Telephone switchboard in dugout. Alaskan beaches are well guarded and connected by a vast communications network.





Communications are being maintained between landing parties and ship. Radio played an important roll in Aleutian Islands offensives.

in the equipment and tested the ingenuity of Signal men to keep the apparatus functioning. Intervening mountains hindered radio transmission. There were no trees or shrubbery to hide the radio antennas, which became a favorite target of enemy fire.

Once wires were laid, it became an almost super-human task to keep them humming with the messages vital to combat success. The Japs placed a strong emphasis on disruption of our communications. Small enemy groups filtered through the American lines and preyed on communications, slashing the wires with bayonets. In certain areas the wires were severed at an average interval of twenty feet. In other places bayonets scraped the insulation from wires, grounding the circuits.

One morning, linemen seeking the cause of a circuit failure, came across the body of a Jap soldier, his stiff fingers still clutching the wire. The wire also ran between the Jap's tightly gritted teeth and the insulation had been stripped off cleanly for six inches or more, shorting the circuit.

And always the snipers concentrated on wire repairmen. Almost every time they went out to patch a line, bullets began to whine around their heads. Still the Signal Corps did the job. The men improvised devices to combat the weather, made protective housings for the terminal strips, and they invented new methods of camouflage. They made radio sets perform near-miracles and they fought to keep the wire circuits operating.

Finally came that last futile attack by the desperate, frustrated, and near-crazed Japs, and all of Attu was ours.

Long before Attu, however, even the men of a Signal Service Company in Alaska—men who handle the more important fixed installations and are not normally expected to engage in hand-to-hand combat — had been trained for any eventuality. Men from that company were in the third boat ashore in the landing at Adak Island in the Andreanof group of the Aleutians. The landing was unopposed, as were subsequent landings at Atka and at Amchitka, in the Rat Islands just seventy miles from Jap-held Kiska, but the Signal Officers realized that if ranking Alaska Communications System men in the task force had been wiped out, it would have been virtually impossible to construct even temporary radio station facilities ashore.

So Capt. Honzie L. Rodgers put his men through a rigid course in marksmanship, camouflage, scouting and patrolling, map reading, use of demolitions, booby traps, and defense against chemical attack.

"Many of our stations are isolated from the main units," remarked Capt. Rodgers. "In case of an enemy parachute attack, one of the first things the enemy goes for is communications. This means that our men must know how

(*Continued on page* 308)

Telephone switchboard in trench connects this lonely Alaskan outpost with base headquarters.



ARMY COMMUNICATIONS

From the "nerve center" at the War Department are flashed communications by radio and wire to every Allied Theater.

By Brig. Gen. FRANK E. STONER



Born in Vancouver, Washington, on December 25, 1894 and attended the University of Washington. Served in the Philippines during World War I, and is a graduate of the Signal School, 1928; the Command and General Staff School, 1937; and the Army Industrial College, 1940. He served as Executive Officer of the Washington-Alaska Military Cable and Telegraph System, 1932-37; Signal Officer, 5th Corps Area and 5th Army Corps, 1940-41; and Signal Officer, 3rd Army, 1941-42. Was appointed to present post as Chief of the Army Communications Service in 1942.

SPREADING out from Washington like an immense spiderweb reaching to every corner of the globe is the most far-flung communcations system in the history of the world. Some ten million words a day, necessary to keep the nation's war machine in high gear, flash over the vast radio and wire channels of the Army Communications Service of the Signal Corps.

Known familiarly as "A. Com," the Army Communications Service itself extends throughout this country and overseas to the headquarters of the various Theaters of Operation—whether they be in London, Brisbane, Asmara, or Algiers. From these centers the system fans out through secondary networks of wire, radio, and submarine cable to American fighting men in tanks, planes, and the farthest outposts, as well as to the lonely Arctic, jungle, and desert stations along the widespread air-ferry supply routes.

To A. Com falls the enormous task of transmitting information without which none of the Army branches could operate. The War Department General Staff couldn't conduct offensives, the Engineers couldn't build roads, Ordnance couldn't manufacture shells, the Quartermaster couldn't move beans—and so on down the line. The messages deal with combat orders and reports from the battlefronts, with changes in personnel, with purchase orders for clothing and equipment, with a thousand other essential operations.

It is one of the responsibilities of Major General H. C. Ingles, the Chief Signal Officer, to provide fixed communication to all Army units, wherever located, as well as the installation and maintenance of all airways communications equipment. He discharges that responsibility through A. Com and its organization, to which is also delegated the functions of field engineering and staff supervision over operation and procedure.

At the outbreak of war the system had begun to expand but was still a comparatively modest organization with only a half-dozen teleprinters and a radio network confined principally to stations in the United States and its possessions. As the Army grew, so did A. Com, working at top speed to keep ahead of skyrocketing requirements, particularly in new areas of action. Feats of engineering were accomplished to develop modern refinements for SECURITY, ACCURACY, and SPEED in the new world-wide system.

Nerve center of A. Com is the War Department Signal Center, the world's most modern and efficient communications headquarters. Here, streamlined message-handling methods are combined with the newest types of radio and wire equipment to speed vital information to its destination without a second's unnecessary delay. Teleprinter, telephone and telegraph circuits connect the Center with all the Service Commands in this country; powerful radio circuits, remotely controlled from the Signal Center, are beamed to all parts of the world, connecting directly and



Moving through dense underbrush with the Army's powerful one-man radio set—the FM walkie-talkie. Weighs 35 pounds complete.



Portable field-telephone switchboard in operation. Telephone communications are a vital link between all military units.

indirectly with hundreds of stations to which messages can be flashed in a matter of seconds.

The Signal Center itself resembles the largest and most modern telegraph central office, utilizing the most efficient apparatus in its operations with wire, radio, and cable. Each phase dovetails with the others to speed the transfer of messages; at every point are set up all possible safeguards to guarantee accuracy and security.

At one end of a long room are scores of teleprinter and cable machines, a huge switchboard, banks of automatic transmitters and receivers, recording and numbering devices. At the other end is the radio remote control equipment, each position topped by its station call sign, and a monitoring turret where distortion, fading, and interference may be detected and corrected.

The progress of a message is so smooth it appears almost effortless. Let us follow an average message from the time it hits the desk until it is transmitted.

The message drops out of one of the pneumatic tubes leading from all agencies of the War Department in the Pentagon. At the tube-head it is processed for transmission, first being cleared by a censor who determines whether the message, if in clear-text form, may be transmitted without being encoded. A clerk scans the message for clarity and construction, checks and notes the number of words to guard against possible omission during transmission, and places it on one of the endless belt conveyors which connect all sections of the Signal Center.

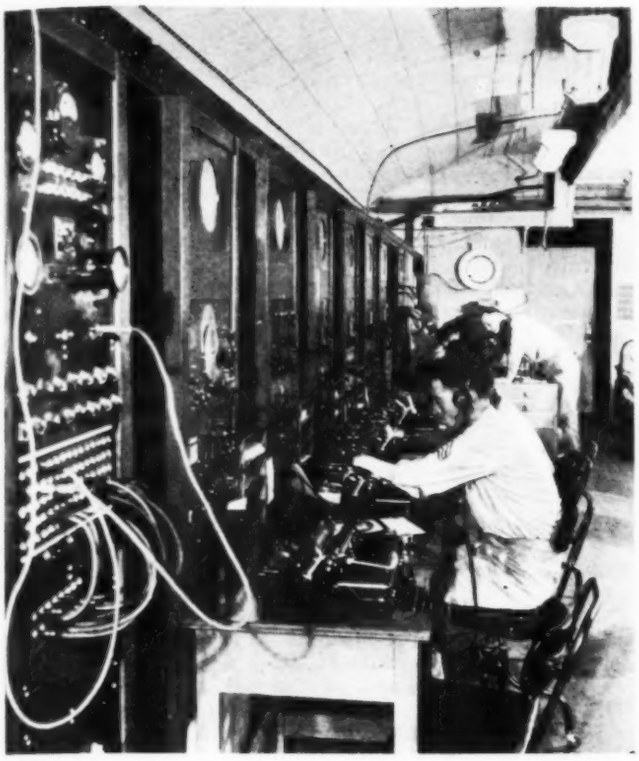
At a routing and distribution desk another clerk determines the proper medium of communication, and enters routing and other data required by the operator, who must not be delayed in keeping traffic moving over heavily loaded circuits. The message glides on its way again by belt conveyor. From this desk the message will take one of several routes.

If it is intended for teleprinter handling, whether over wire, radio, or cable, the message goes to a bank of transmitting positions where expert operators man high-speed perforators. These keyboard operators translate the mes-

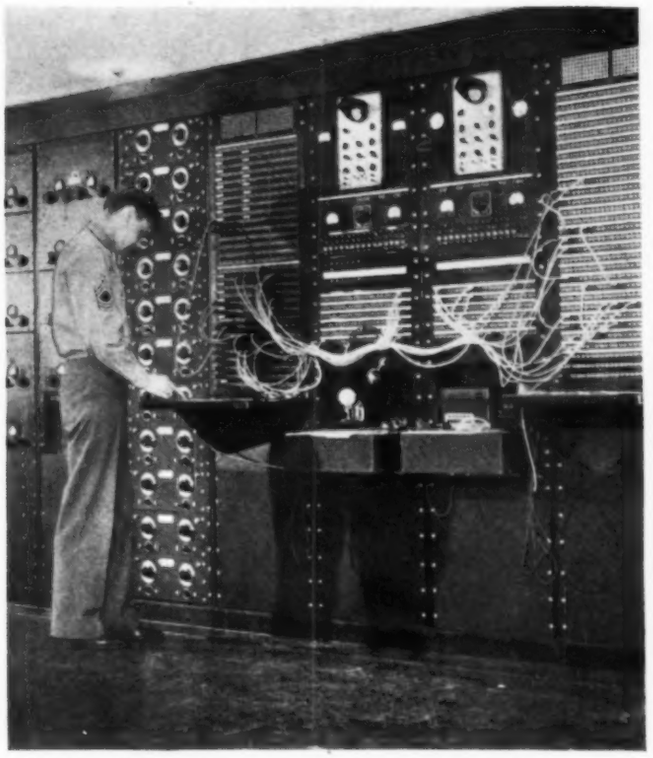




(Left) In the sub-zero temperatures of Iceland—communications covering a radius of one mile may be had with this tiny military transceiver. (Below) Antenna layout of radio station located in Iceland consists of 9 doublet antennas suspended from four 60-foot poles. This station handles all communications on the island.



Radio room of one of the larger military stations. All radio transmissions throughout the world are frequently monitored.



Radio switchboard connecting the Signal Center and the actual transmitters and receivers of Station WAR several miles away.

sage into perforated tape, in which each character is represented by a series of five or less holes across the tape. As the tape is perforated, it passes through a transmitter which sends the signals over a wire, radio, or cable circuit. A message may be relayed at several stations in a teleprinter-operated network without again being manually re-transmitted, because at each point it will be received on a printer reproducing the original message in typewritten form. If the message is intended for wire, cable, or radio circuits operated by manual or direct keyboard-printer method, it goes to an operator who transmits it directly.

The entire process requires as little as three minutes for a short message of fifteen to twenty words. An analysis of 40,000 messages showed that the average handling time was 8.4 minutes, even though some of them were hundreds or even thousands of words long. Every known mechanical device is used to eliminate lost motion and time, and new apparatus and methods are constantly sought to improve the service still further.

In teleprinter, especially, a minimum of manual handling is necessary. Automatic receivers and transmitters eliminate much of the "middle-man" work usually involved in communications. If a message is to be relayed in the Signal Center—say it is coming in from Atlanta and is to go to Chicago—the end of the perforated tape is placed in the transmitter on the Chicago circuit while the rest of the message is still being sent from Atlanta.

An ingenious device called a "line-finder concentrator" is used to conserve equipment and prevent congestion. By this means twenty-four relatively lightly loaded lines are terminated in eight receiving machines in such a way that when any one of the twenty-four stations wishes to send, the apparatus will automatically seek out an idle receiver and connect it to the line. If no receiver is idle, it will store the call and connect it to the first receiver that becomes idle, sending a signal to notify operators at both ends of the situation at all times.

All outgoing messages must be consecutively numbered to guard against loss of messages and also to permit quick reference in case of garbles or any other condition which would require the original copy to be consulted. In heavily loaded circuits, messages are numbered automatically by machines which also reproduce exactly everything which

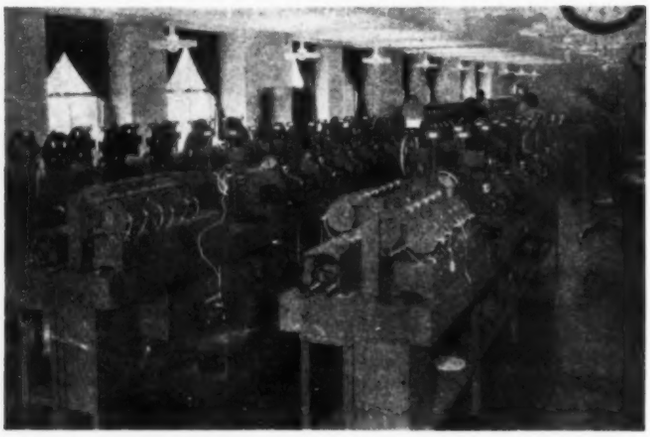
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Member of Regimental Headquarters operating a late model guidon set. The r-f portion of the unit is mounted to the antenna mast.





Monitor room of a military radio station. A bank of teletype machines, shown at the right, is used to expedite messages.



Bank of automatic recording and numbering machines which reproduce on separate rolls of tape all teleprinter transmissions.

is sent over the circuit, greatly reducing the time required to find a copy of any outgoing message. Mechanical breakdowns are rare, since each machine is overhauled thoroughly after it has been in operation for a specified number of hours.

Several radio transmission methods are used—the ordinary international Morse code; voice; the Boehme siphon system in which the Morse code becomes visual as a stylus converts the dots and dashes into a staggered line; the IBM, or radiotype, system which handles one hundred words per minute, and radioteletype, operating at 60 words per minute.

Pictures are received and transmitted in the Signal Center by wire and radio telephoto, discussed in a separate article in this issue of Radio News.

Station WAR, remotely controlled and operated from the Signal Center, is the hub of the Army's huge radio net. WAR actually consists of a number of stations near Washington, with its transmitters ranging in power from one to forty kilowatts and its complete diversity and high frequency receivers incorporating the latest developments in radio engineering. An elaborate layout of rhombic type, uni-directional antennas is included in the installations for better utilization of power.

A recent development is the use of radio links between the Signal Center and the transmitting and receiving points, to eliminate dependence on wire lines for remote control operation. By use of ultra-high frequencies, six signals are carried on each of several radio channels.

The progressive substitution of wire for radio operation within the United States has released equipment, personnel and frequencies for the rapidly increasing volume of overseas radio traffic by Station WAR. In the first two years of war, new stations have been installed in London, Bermuda, Chungking, Iceland, Asmara, New Delhi, Brisbane, Oran, Cairo, Algiers, Trinidad, Recife in Brazil, and Accra on the gold coast of British West Africa. Add these to previously operated stations in Panama, Puerto Rico, Alaska, Hawaii, and other points, and you get some idea of the scope of the organization.

With the great station in Washington as a focal point, each station at the headquarters of a Theater Commander is the center of a net comprising the area of that command. Lesser stations are located within the Theaters, each in turn the key point in a still smaller system—until finally at the outer fringes of the web, the chain of communications actually reach individual soldiers carrying walkie-talkie sets. Yet the system is so beautifully integrated that the chain is continuous from the highest command in Washington to the most remote combat unit, aircraft, or tank crew in the field.

At the same time the world-wide net is so inter-connected that interference—man made or natural—seldom, if ever, completely halts a message. It can be sent out by another circuit that is connected with the receiver for which the message was originally destined.

A "gentlemen's agreement" with commercial agencies helped A. Com to acquire skilled technicians and operators without hampering essential private facilities. The Signal Corps agreed not to proselyte personnel from the companies which in turn co-operated by volunteering numerous thoroughly experienced men, who became officers in key positions after a period of processing to adapt them to military methods. These agencies also supplied the names of inductees who had been expert technicians in civil life, so that they could be requisitioned by the Signal Corps.

Many of these, after learning the Army techniques, quickly earned non-commissioned ratings and worked in closest harmony with old-time Signal Corps personnel in the common purpose of getting the Army's messages through by the fastest, most accurate means possible.

One of their tasks was to train the newcomers, many of whom were members of the Women's Army Corps, with no previous telegraphic experience. That the instructors did their job well is attested by the praise earned by the WACs—former college students, housekeepers, school teachers, secretaries, and welders—in their new positions as machine attendants, teleprinter operators, radio operators, clerks, and supervisors.

The Signal Center also acts as a "finishing school" for operators and technicians. After they have learned the theory in basic schools they attend a three-months practical course near the Signal Center itself, where they practice on messages that actually have been transmitted so that they can familiarize themselves with realistic working conditions. They then undergo a period of "internship" on regular circuits.

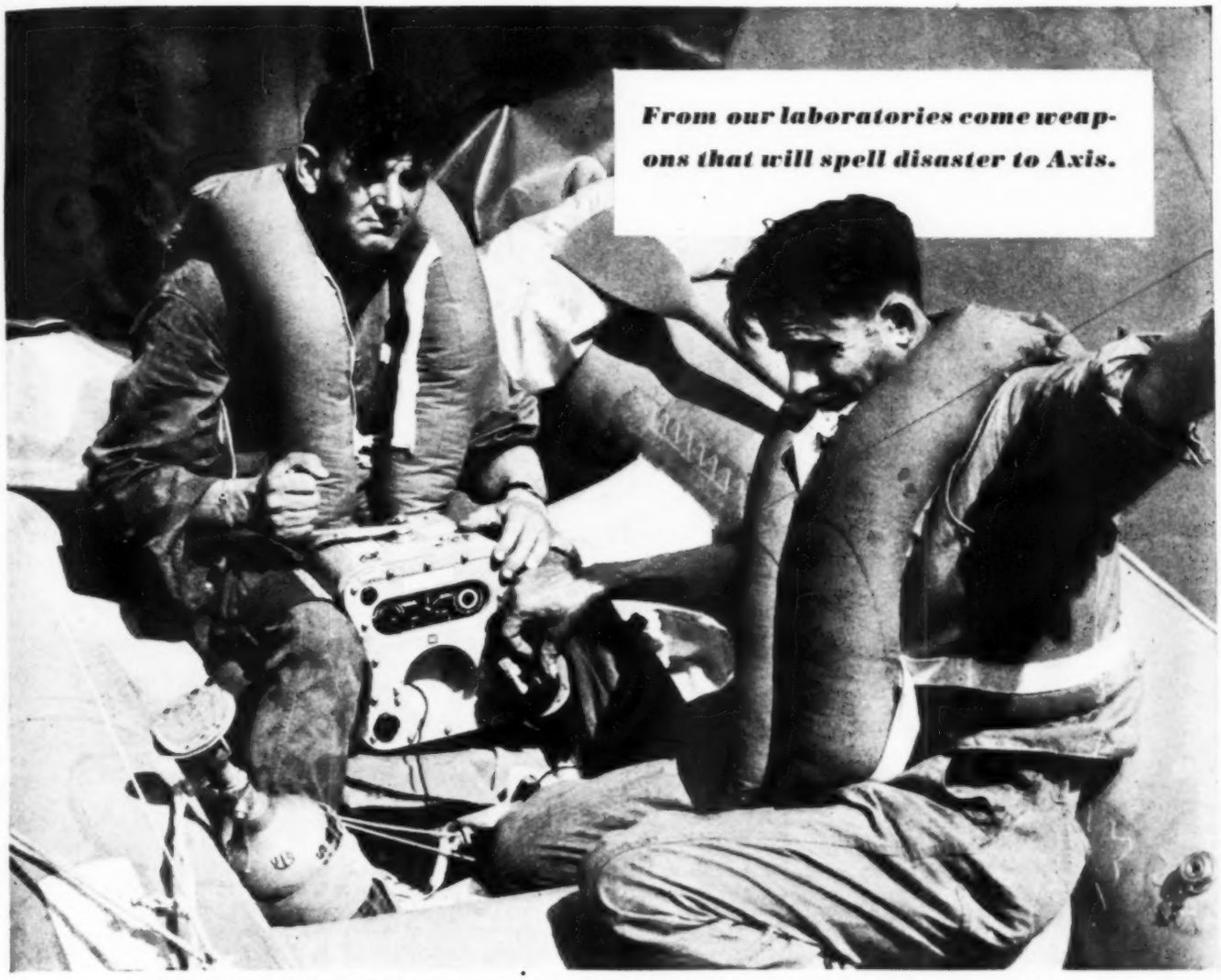
They do not become full-fledged WAR operators, however, until they can send and receive manually at thirty-five words per minute. They must be able to read recording tape at fifty words a minute, to operate a teleprinter, and to understand all of the delicate equipment with which they work. Teamwork is stressed, and each man is trained to handle any of several jobs. Thus is created an efficient, highly flexible force.

Such training is conducted continuously to compensate for a constant turnover as A. Com sends its trained specialists to fill key positions in installations throughout the system. Accuracy, even more than speed, is stressed during training and subsequent actual operations. If a flaw develops in an operator's technique, he is sent to a "refresher" class where an expert irons out the difficulty.

Even while A. Com kept pace with the Army's phenomenal expansion, it still found time to analyze and revamp the existing domestic systems for better efficiency. With the sudden outbreak of war it was necessary for almost every branch of the Army, particularly the supply and technical services, to establish its own independent communications system, taking advantage of any facilities at hand.

Gradually, working carefully to avoid even a momentary letdown in efficiency, the Signal Corps began to absorb

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The "Gibson Girl" automatic SOS transmitter. Antenna wire is being released preparatory to operation.

OPERATIONAL RESEARCH

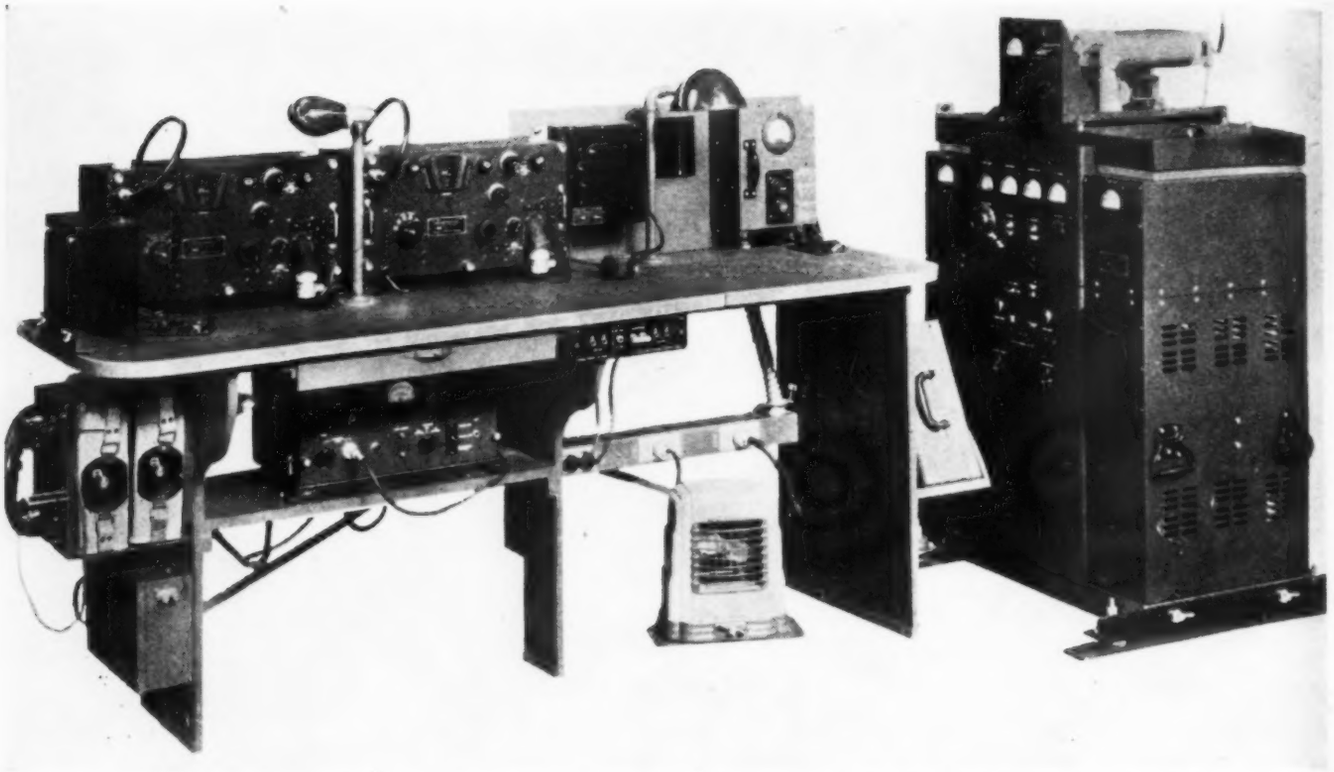
By Dr. W. L. EVERITT



Born April 14, 1900 in Baltimore, Md. Served with U. S. Marine Corps in World War I, and later received a B.S. degree in E.E., Cornell University, 1922. In 1926, received an M.S. degree from the University of Michigan; gained Ph. D. in 1933 from Ohio State University, and has been a member of the faculty since 1926. Was appointed Chief of the Operational Research Branch in March, 1942; is now on leave from University post. Dr. Everitt is a Fellow and Director of Inst. of Radio Engineers, and a Fellow of American Inst. of Electrical Engineers.

THE scientists, engineers, and manufacturers of the country have rallied behind the tremendous research and production programs involved in the war program. One of the most important parts of this program is the provision of the world's best electronic and communications equipment for the armed forces. In this, the Signal Corps is a natural leader.

The enormous progress which has been made has given rise to many problems. Laboratory research has been speeded up to a point where years of peacetime progress have been compressed into a matter of months. Service, industrial, and university laboratories have been expanded and new ones set up, some of them devoted exclusively to specific problems. The flow of new ideas and devices is amazing. Production has kept pace with laboratory developments and our forces are receiving an ever increasing flow of fabulous electronic devices.



Principal components of radio set SCR-299-A. Apparatus shown, when in final assembly is installed in truck K-51.

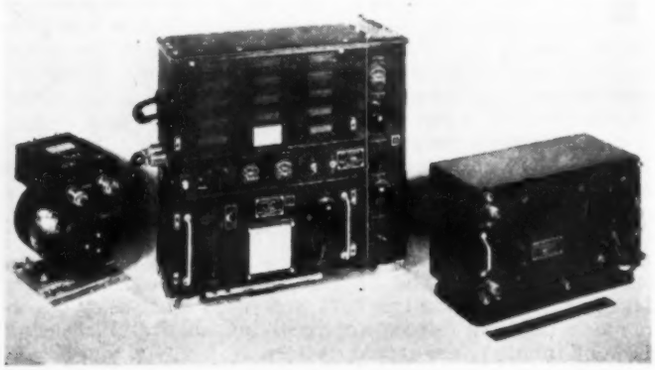
Under ordinary conditions, the design of new equipment is greatly influenced by the experience which the users of previous models obtain and return to the manufacturer in the form of suggestions, complaints, and commendations. We have all been told by the auto salesman that the faults of last year's model of his particular car are admitted but the new model has eliminated all those difficulties.

While we take this with a grain of salt, we have observed the improvement which the test of time and abuse by the customer has produced in cars, washing machines, and radios in the past ten or twenty years.

But in war, the speed-up is so great that new models are being planned before previous models have come off the production line. Yet failure to meet the customer's needs may exact a terrible price, for the customer in this case is an army in battle.

Military operations introduce new problems in every war, for battles are not won by depending solely on the experience of the last war or the intervening peaceful years. In particular, technical military equipment and personnel are being introduced to new conditions because of the high mobility of the war, the extreme variations in climatic conditions, the long lines of supply, the difficult maintenance problems, and the fact that a wholesale conversion of men to new technical skills in a short time has been necessary.

Radio set SCR-193 showing dynamotor, transmitter, and receiver.



Modern industry in peace times has found that, when acceleration in a program is necessary, it cannot depend on rule-of-thumb experience but scientific analysis or research in the broad sense can solve many problems satisfactorily in a surprisingly short time. In a similar way, the application of scientific methods to the analysis and solution of the problems involved in the use of new types of military equipment is indicated.

The scientific study of how best to use equipment and men and how to accelerate the application of field experience, in the guiding of development and procurement programs, has been termed operational research. The Operation Research Branch has been formed in the Plans and Operations Division of the Office of the Chief Signal Officer to make these studies. The personnel includes engineers with experience in the operation of radio equipment such as broadcasting station engineers, consulting engineers, engineers with manufacturing experience, statisticians, and psychologists. Each member of the group was selected because he had shown by past performance that he was expert at solving operational problems and getting the most out of equipment and men.

The final purpose of all signal equipment and personnel, is to provide a communications service; namely, the transmission of messages and, in the case of military operations, these messages must be transmitted without errors. This is the ultimate goal of all the research, development, production, and supply services which have gone before. Therefore the most important task of all is to determine the best methods of operation of the equipment supplied. The importance of this work becomes progressively greater as the war continues since the probability of translating current basic research into equipment which will be used in this war becomes lessened and the importance of properly using what we have becomes greater and greater.

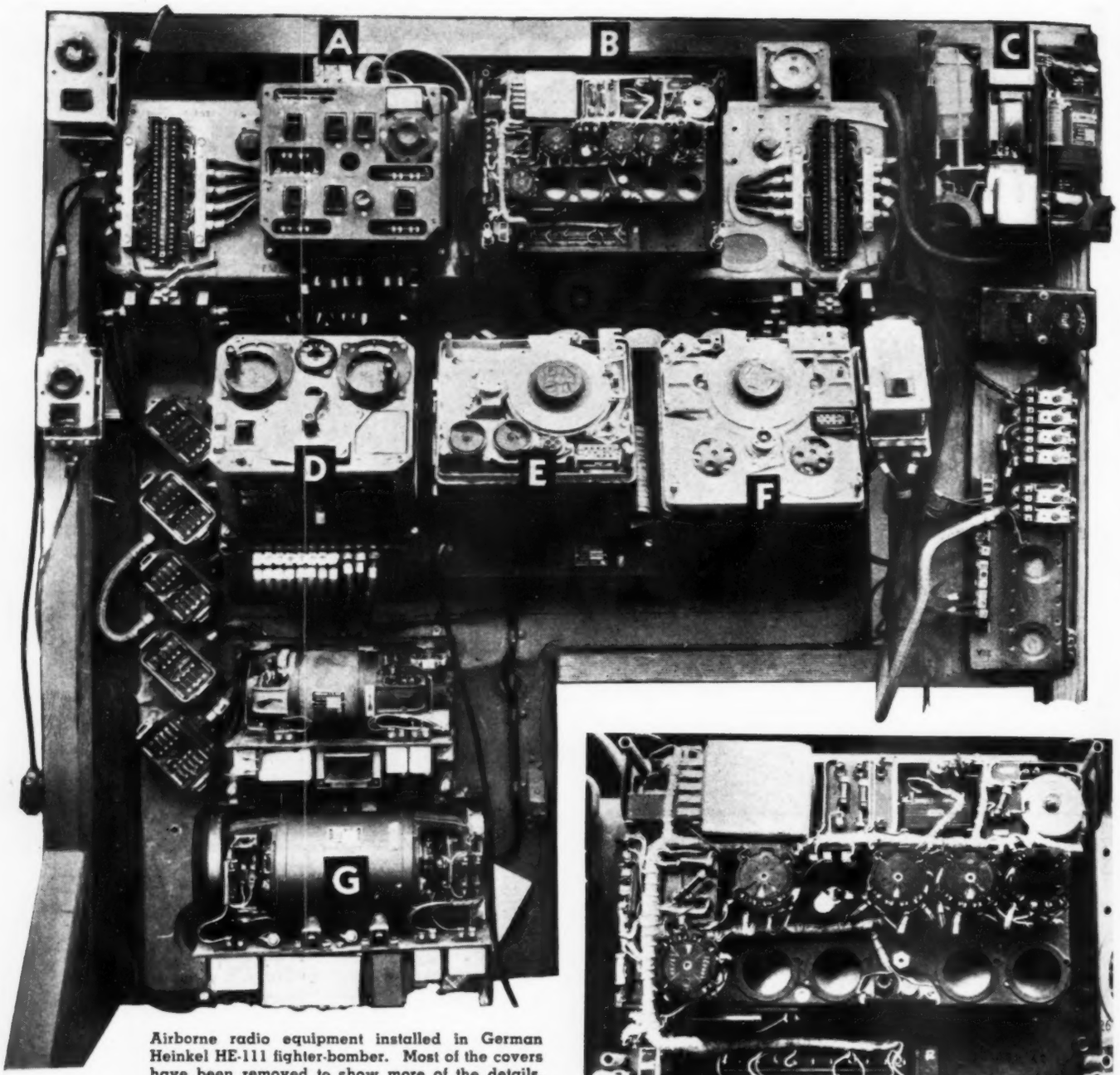
The provision of communication service always involves personnel plus equipment. Operational research naturally divides itself into studies of personnel and studies of equipment, while, at the same time, keeping the relation of one

(*Continued on page* 320)

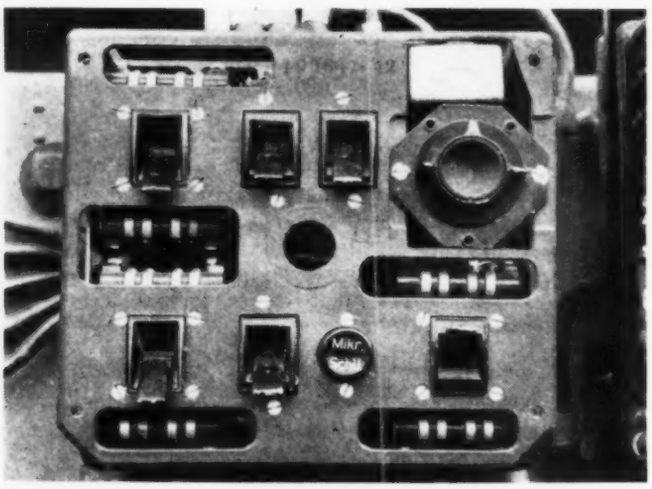
CAPTURED ENEMY EQUIPMENT



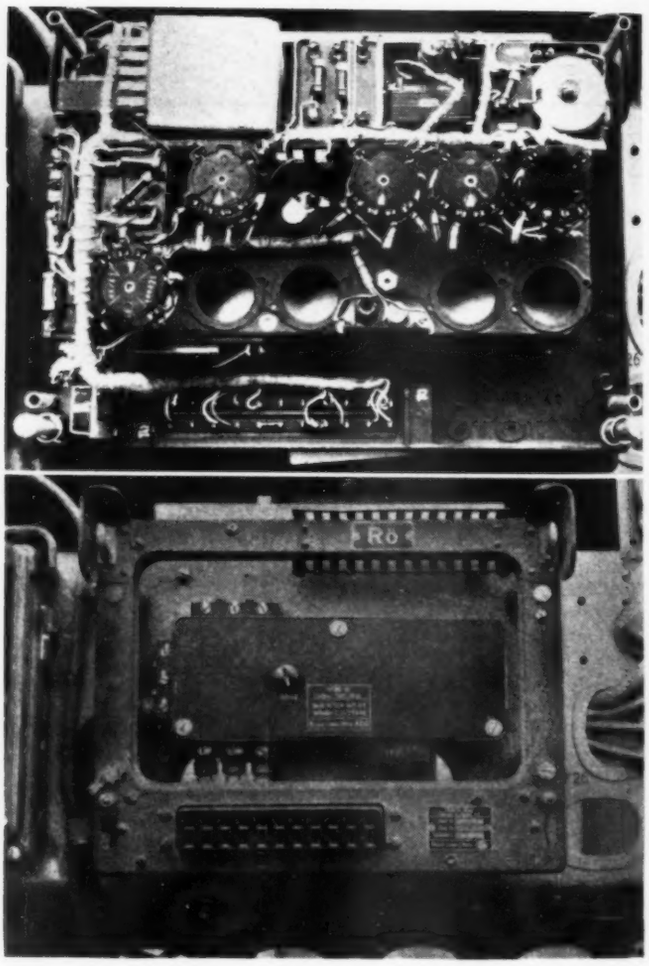
AMERICAN radio engineers are now able to study the characteristics of various types of communications equipment taken in combat and from enemy planes shot down over Allied territory. The personnel of the U. S. Army Signal Corps has made careful analysis of the construction, parts, materials, wiring techniques, tubes, circuits and tactical applications. Certain workable units are sent to combat training centers to be examined by students. They become familiar with those that might be found in the foreign theater in which they are to be sent. The tactical use of all captured equipment is restricted to the general public and is omitted from the units shown within the special section following—for security purposes.



Airborne radio equipment installed in German Heinkel HE-111 fighter-bomber. Most of the covers have been removed to show more of the details.



A The master control unit Fbg features a paddle-like type of toggle switch for easy operation while wearing gloves.

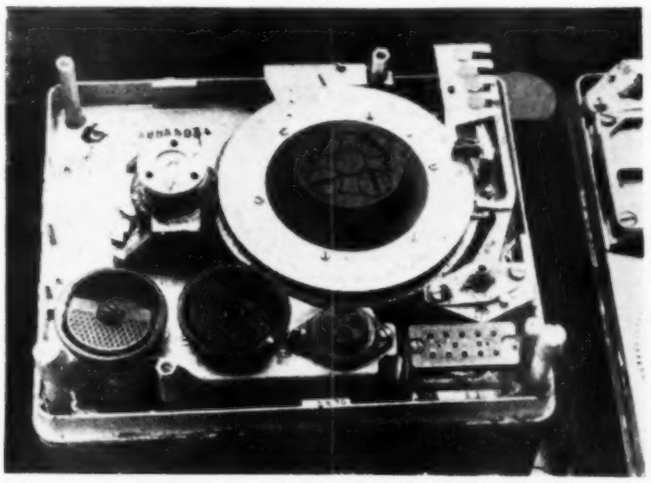


B Top: Interphone and amplifier unit RG, 10a chassis. Bottom: Quick-change mount permits tube replacement.

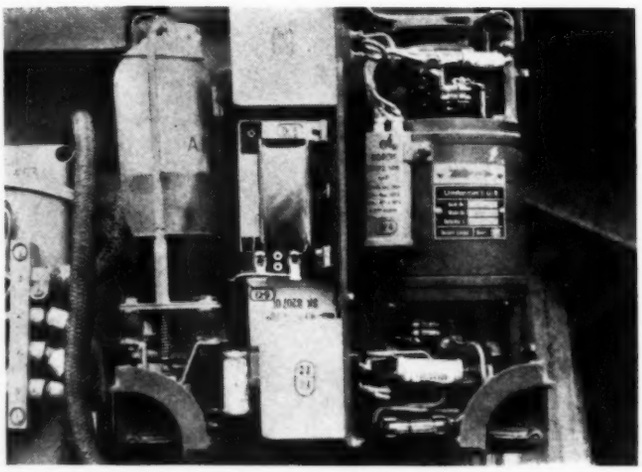
GERMAN EQUIPMENT

Developments in the period 1934-38 have set the standards for German equipment. Although ruggedly built—their sets are inferior to ours in construction, design, and weatherproofing.

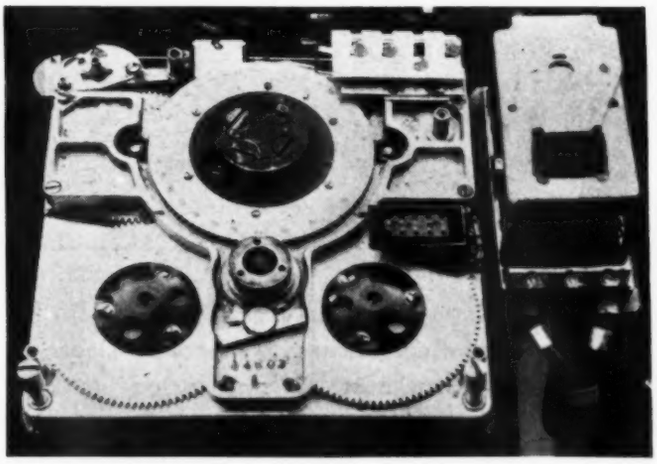
All of the units shown on this and the preceding page are a part of the German Airborne set FuG10. Technical characteristics: Frequency range: (mc) .3-.6 (S10L & E10L); 3-6 (S10K & E10K); 5.3-10 (S10K2 & E10K1). No crystals are used—either in the transmitter or receiver. Preset frequencies: 4 click stops. Antenna: Both trailing and fixed, connected by 50 ohm feeder tuning units at base of each antenna (remote control tuned). Tuning: (MO or Xtal) MO-Temperature compensated. Power output: 65 watts. Tubes: Total—31. Combined weight: 400 lbs.



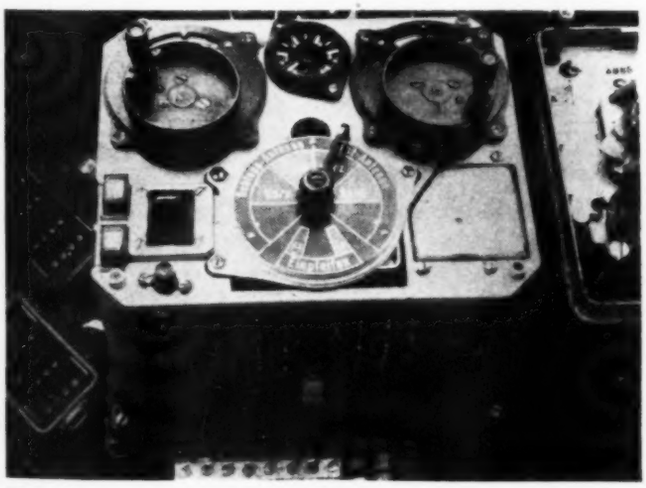
E Receivers may be interchanged to cover various ranges. This is the S10L, covering from .3-.6 megacycles.



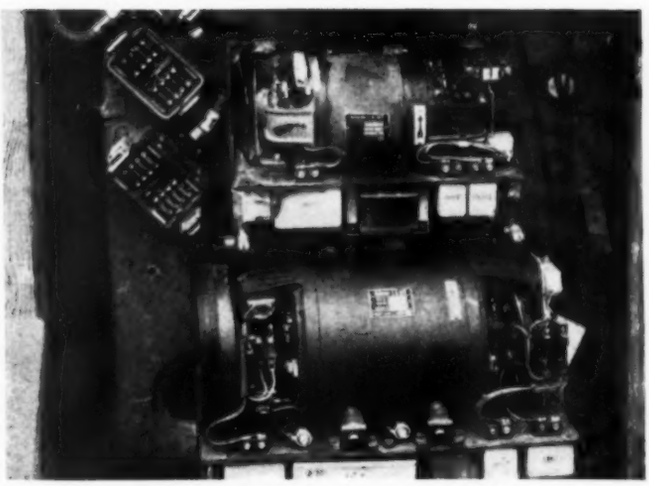
C Voltage-regulator unit and power supply uses the German "Stabilvolt." Supplies power for FuG10 radio compass.



F Intricate dial mechanisms predominate German sets. Note the "vernier type" of elaborate tuning assembly.



D Antenna control unit, with indicator, permits accurate loading adjustments to resonate antennas to frequencies.



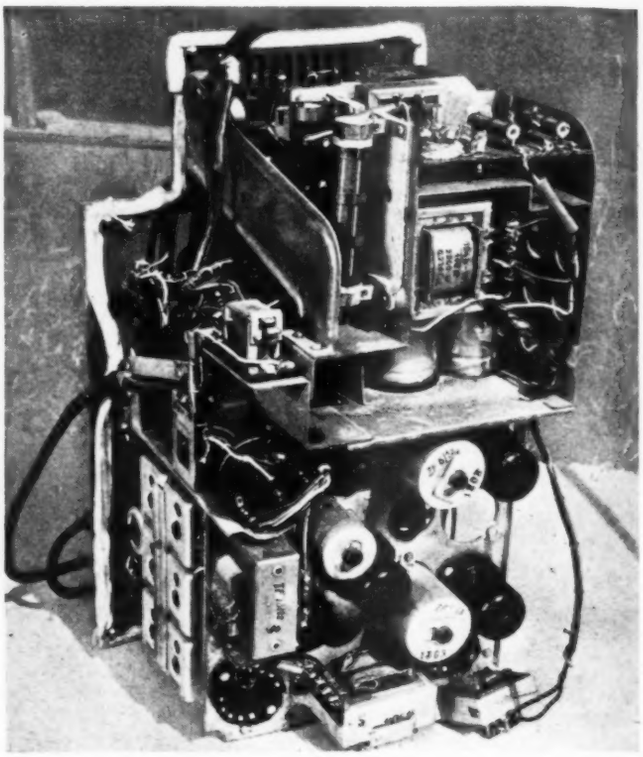
G The main dynamotor power supply equipment is shock-mounted. Designed specially for high altitudes.

TYPE WR 1 RECEIVER

Used for broadcast reception for entertainment and propaganda purposes at rear echelon. Frequency range: .15-15.8 mc. Tuning: MO or Xtal. Posted sticker reads "Use of this radio for foreign station reception is a crime against the National safety. By order of Der Führer such use will be punished with severest penalty. SOLDIERS, BEWARE!" This set is inferior to average.



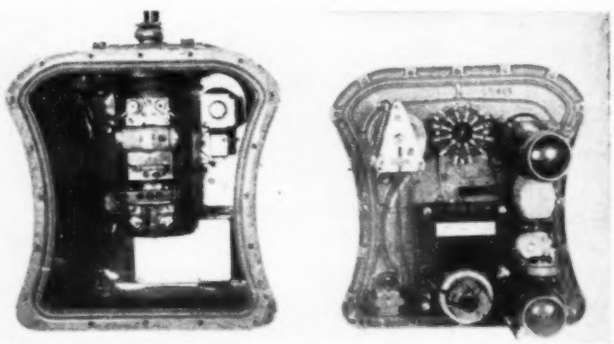
Knob near center controls a variac for choice of 110-220 v.



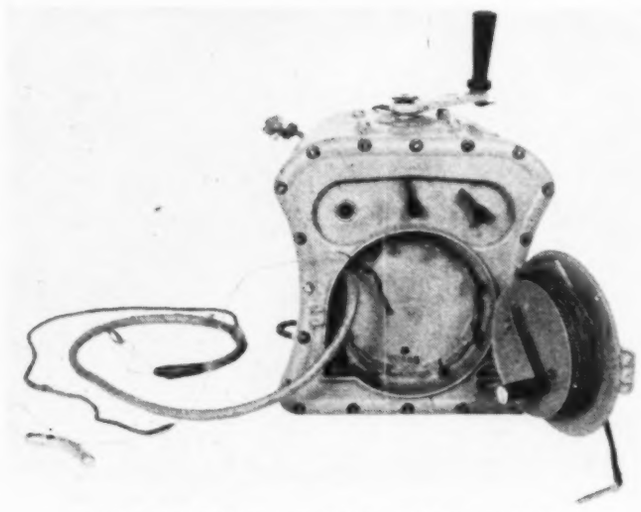
Poorly wired and haywire constructed chassis components.

NS2 "NOTSENDER"

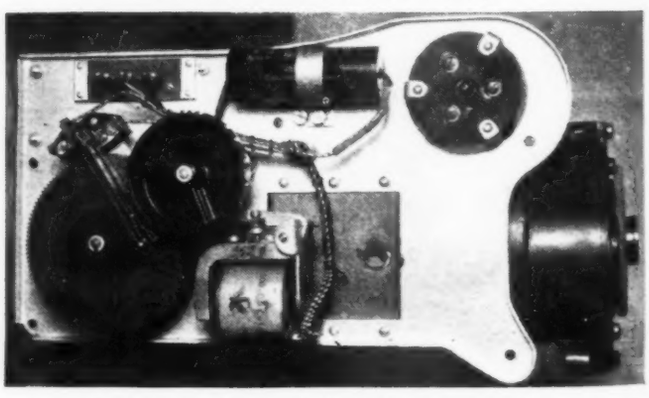
An emergency dinghy transmitter, carried loose in the aircraft, thrown in water and picked up after dinghy is floated. Frequency range: (mc) .5 only. Antenna: Kite-hoisted, or balloon-hoisted with ground wire and sinker. Hand generator. Power output: 6.2 w.



Insides of unit show R.F. assembly.



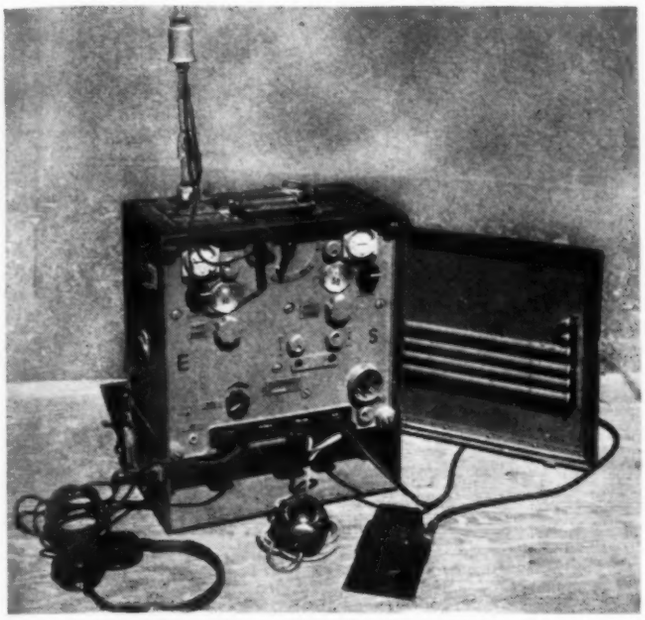
Wire reel and antenna cable are here exposed.



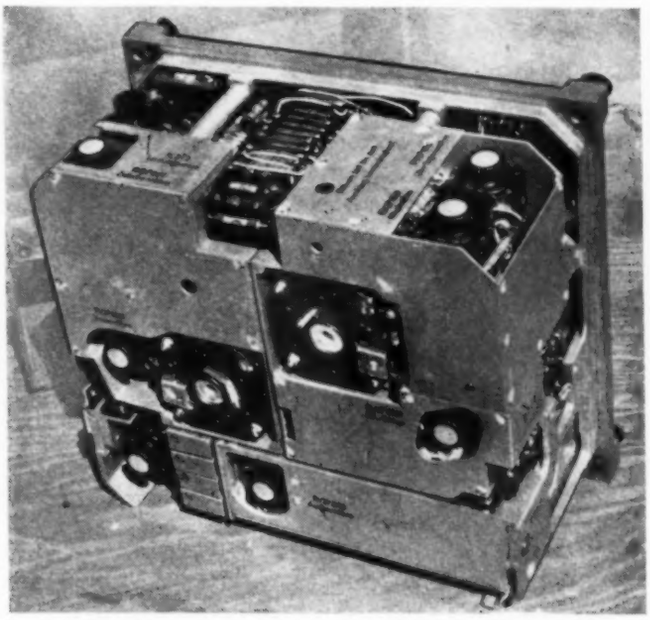
This mechanism controls keying automatically.

TORN Fud 2 TRANSCEIVER

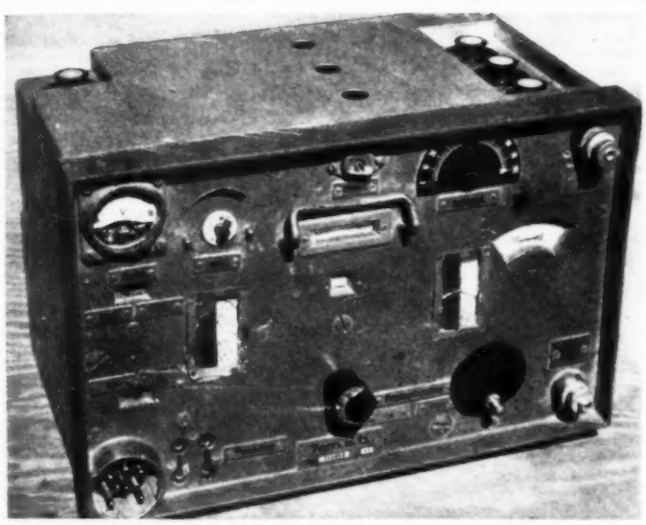
Infantry pack set; used primarily for communications between Battalion and Companies. Frequency range: 33.8-38.0 (mc.). Antenna: 12 ft. aluminum rod. Power source: 2 v. A's, 130 v. B's. Power output: 1 watt. Tubes: 4 (receiver) and 3 (transmitter).



Magnifying lenses over dials permit quick tuning.



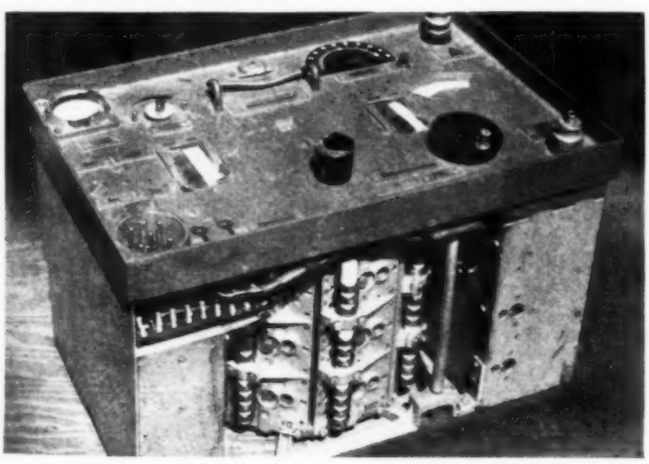
Sturdily-constructed, the unit weighs about 38 lbs.



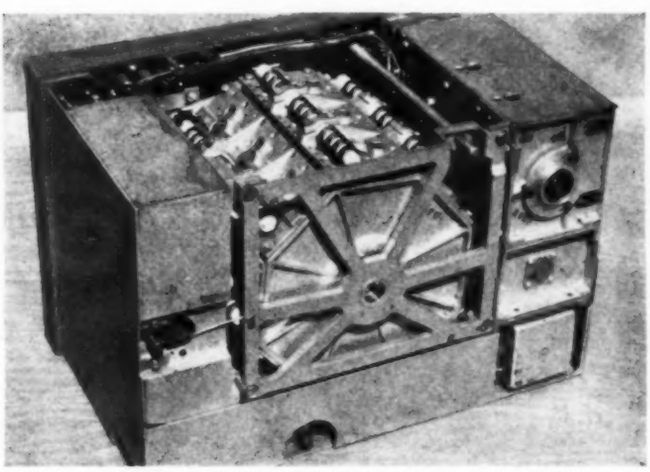
One of the most widely used sets in the German army.

TORN E.b. RECEIVER

Used for portable and intercept and monitoring stations requiring a wide freq. range for reception. Frequency range: (mc.) 8 bands: .0966-.1772; .171-.3137; .304-.5585; .540-.990; .995-1.74; 1.674-3.075; 2.920-4.920; 4.360-7.995. Power source: Vibrator unit, input 1 amp., 12 volt output and 2 volt filament supply. Battery operated: 2 v/800ma.; 90 v/12ma. Tubes: Four RV 2P 800 "knob" type pentodes. The combined weight of components is approximately 51 lbs. including power supplies.



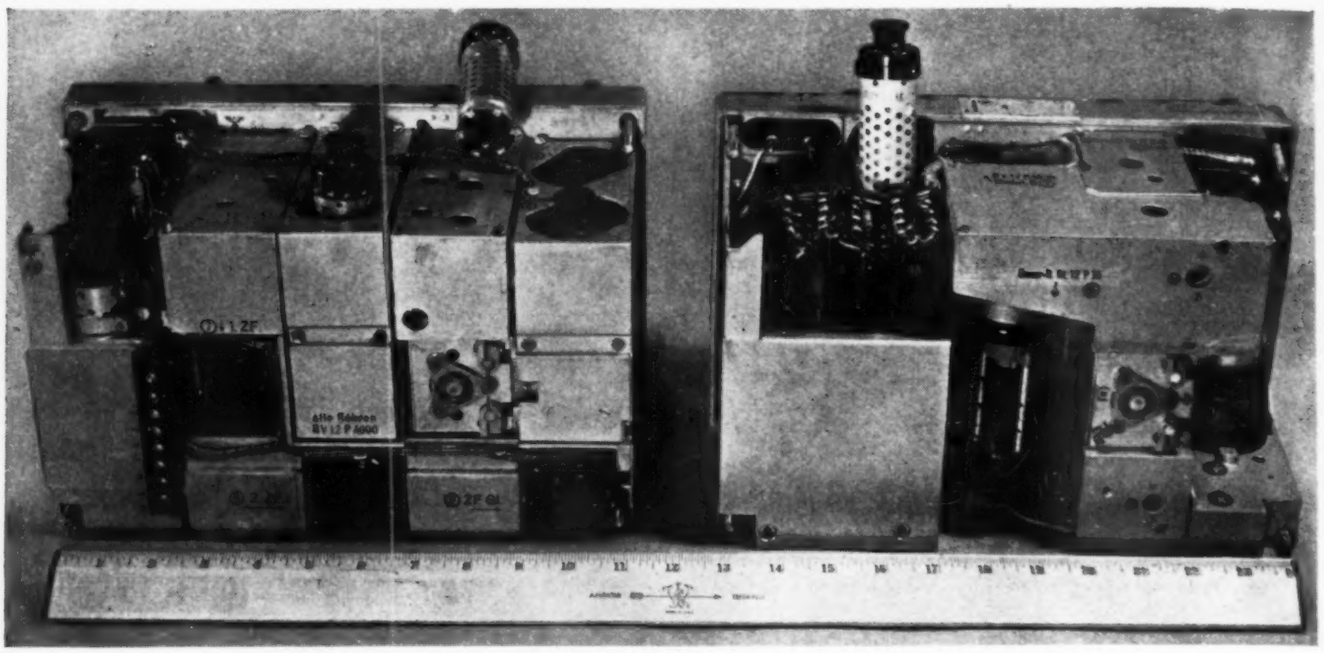
Lo-loss coils and magnesium shields are used freely.



Coil turret assembly is rotated by means of gears.

10 W.S.c (Trans.)
U.K.w.E.e. (Recvr.)

Used in tanks and armored cars. Frequency range: (mc.) 10 W.S.c. 27.2-33.3, W.S.h. 23-24.95. Antenna: Two or three mast sections on vehicle (2 meters) or tuned antenna for ground use. Power source: Dynamotors operated from 12 volt portable batteries.

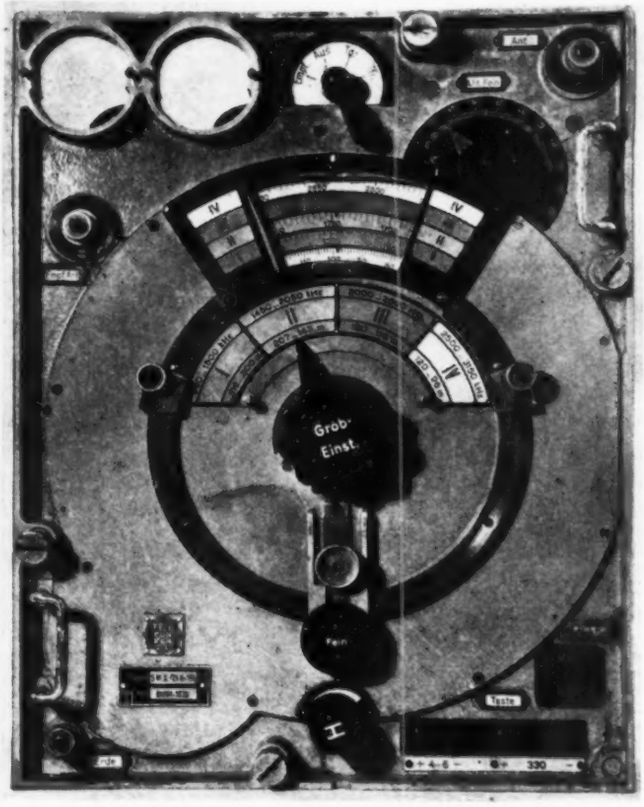


Left: Rear view of the tank receiver. Right: Transmitter unit showing tube locations.

5W.S. PACK TRANSMITTER

The 5WS covers the following frequencies: .95-1.5; 1.45-2.05; 2.0-2.6; 2.5-3.15 (mc.). The 445b. is a universal portable receiver.

SPEZ 445b. RECEIVER



Of old design and engineered for "green" personnel.

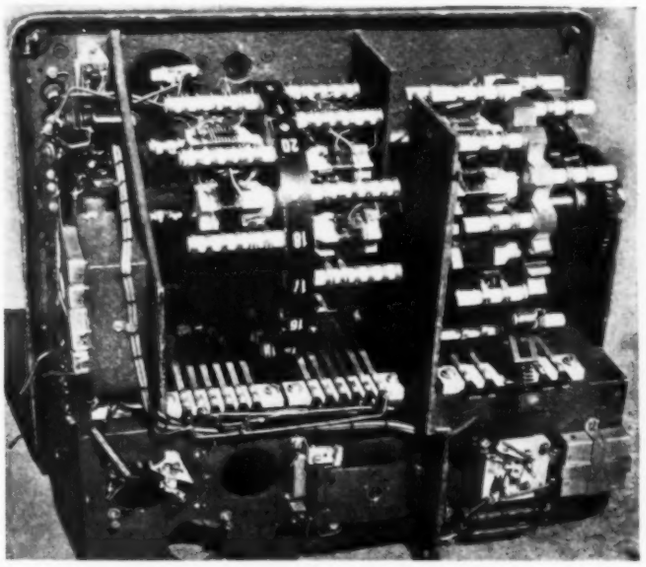


Obsolete T.R.F. receiver—replaced with Torn E.B.

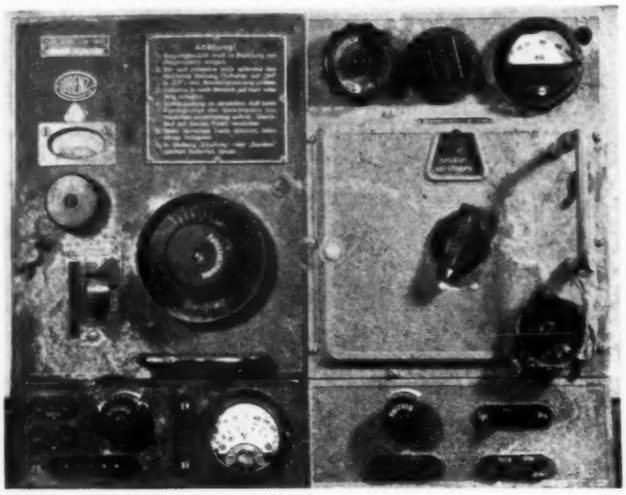
FREMES a.

Frequency meter for measuring frequencies of transmitters and receivers. It covers from 28.5-31 mc. Twenty sets of coils are arranged on ceramic spools. Turret revolves. Uses four tubes.



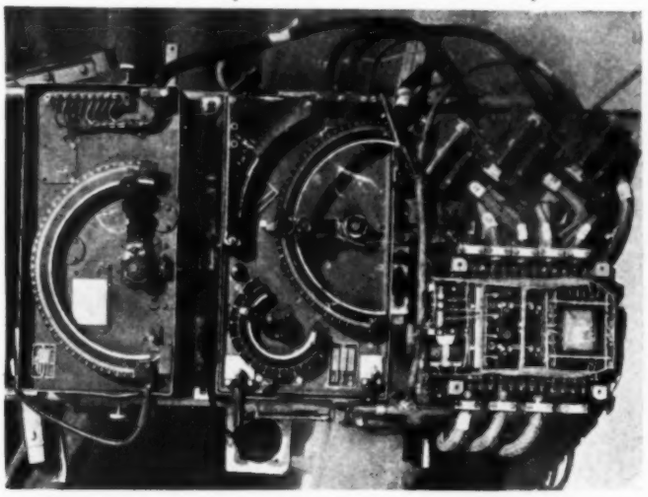


SE.a 2/24b-202 (Transcvr.)



Compact, well-built pack set. Used by German infantry.

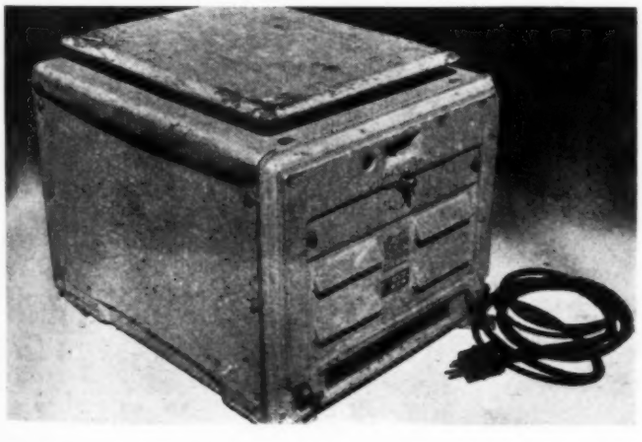
FuG 7 (Airborne Trans.)

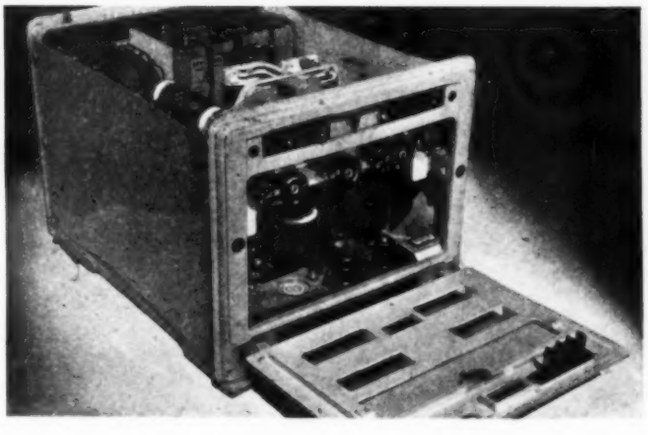


Used for single-seater planes. Trans. and Recvr. rubber mounted.

BATTERY CHARGER

Rectifier-type 12 volt charger. Used for tank and armored car radio sets. Paper condensers are used freely.





U.k.w.E.e. Recvr. (27.2-33.4mc)

Used in tanks and armored cars for signal communications in tank networks. CW-Phone.



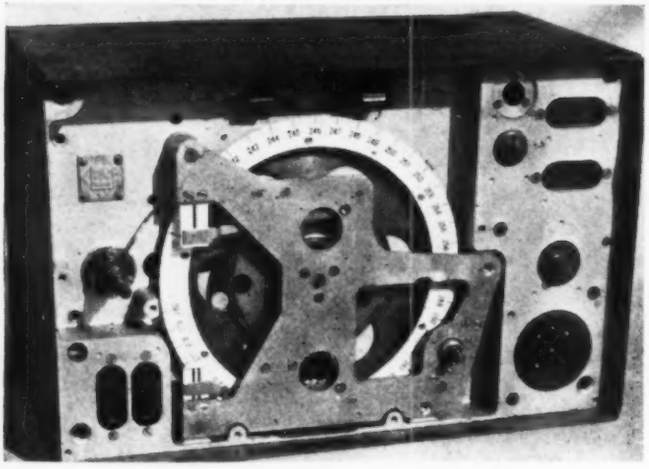
Well-constructed, light in weight, efficient design.



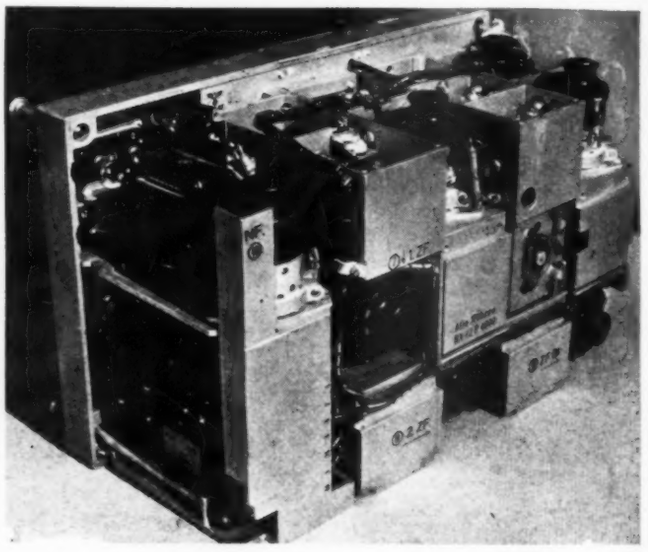
Cast metal boxes are used to shield various circuits.

U.k.w.E.h. RECEIVER

This set is similar to the U.k.w.E.e. shown above. No crystals are used in transmitters or receivers.



Another intricate and efficient tuning mechanism.



Rear view shows neat cabling and use of baffles.

FUSPRECH a TRANSCEIVER



The German unit (left) compared to our SCR-536 (right).

30 W.S./24b-120 MOBILE TRANSMITTER



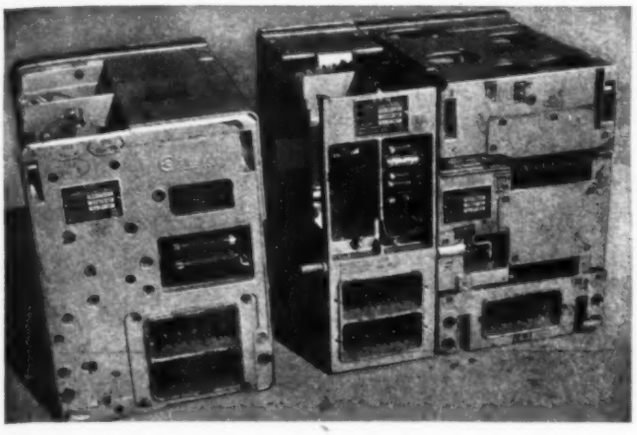
Used for mobile ground-to-air radio communications.

FuG.16 (Airborne Set)

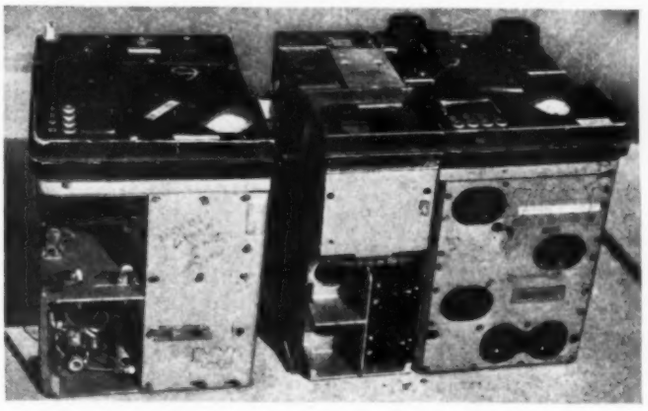
By standardizing on one tube (HF Pentode) it may be used throughout receiver and modulator by connecting them as a pentode, triode or diode in the various stages. Coils are made by electroplating silver on a spiral groove on the forms—followed by a thin copper electro-deposit form. Frequency range: (mc) 38.6-42.2. Preset frequencies: Four, both transmitter and receiver. Power source: Dynamotor (24 v.). Power output: 10 w.



Left to right: Receiver, Modulator and Transmitter units.



Rear view shows three-unit construction and connectors.

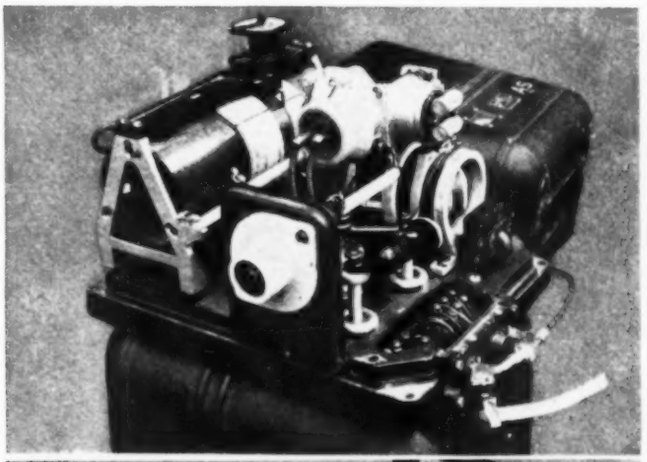


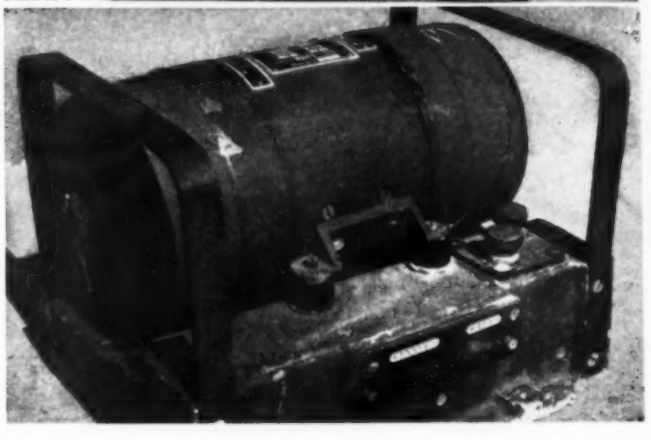
Top view of the FuG.16. Transmitter, modulator, and receiver.



Above: Remote-control unit used in conjunction with Torn Fuf, Fuheu, Fud2 and Fub1 pack sets separated to 250 yds.

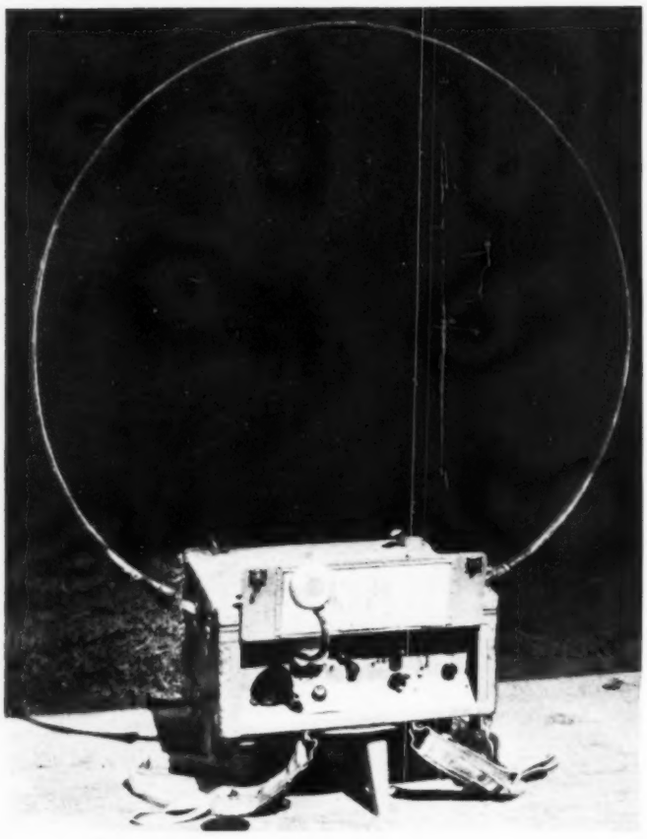
Above right: Antenna control with Selsyn indicators for operation with the German FuG10 airborne sets.



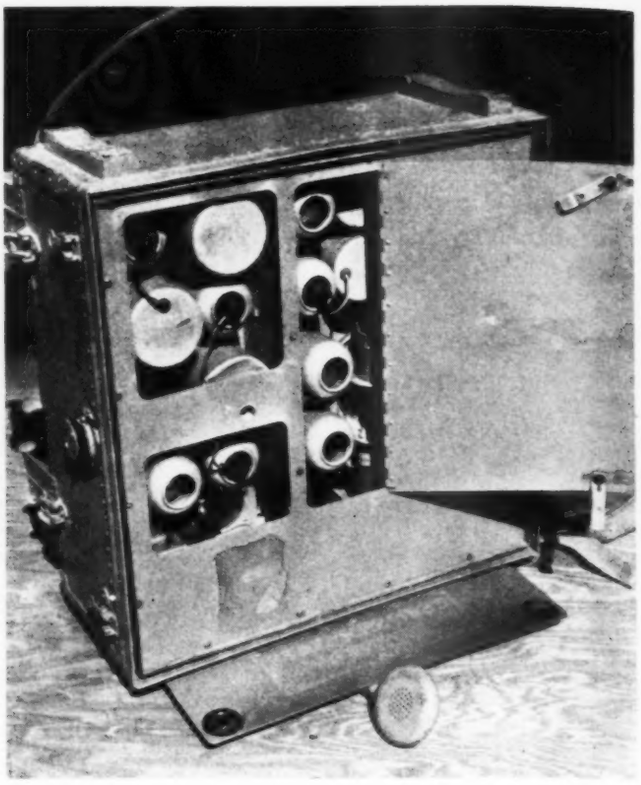


Captured German dynamotor. Supplies power to the 100 W.S. transmitter. Resembles American units.

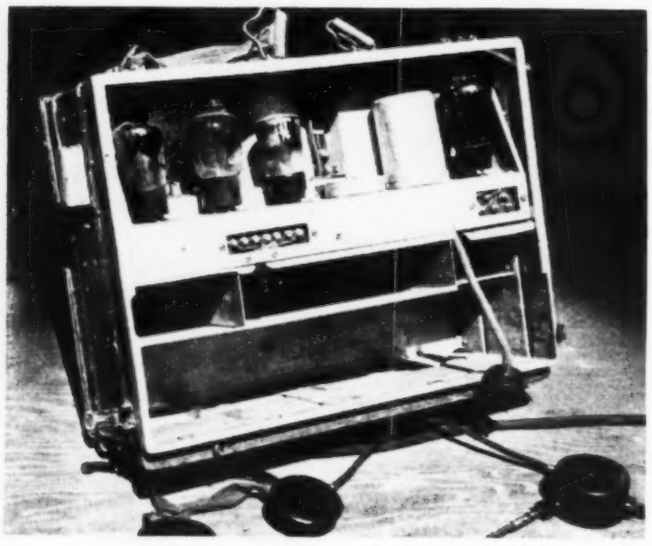
GERMAN-ITALIAN



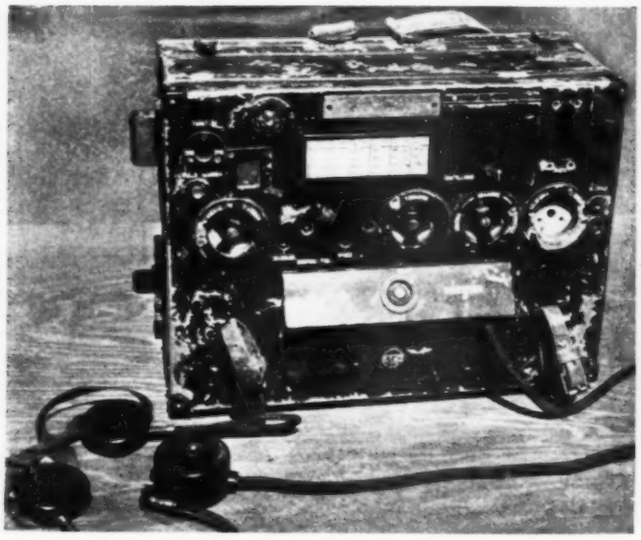
STAZ-R.F. 2 TRANSMITTER



Used within artillery units, transported by animal, cart, or by 2 men. Dry battery operated. Grid modulation varies plate voltage. Luminous quartz crystal used for calibration purposes. Uses loop antenna for better directivity.



STAZ-R.F. 1 PACK SET



Frequency range: 2-3 (mc). Dry battery operated. Used within Infantry regiments and Infantry regimental tactical nets. Heising modulation. Crystals used in both transmitter and receiver.



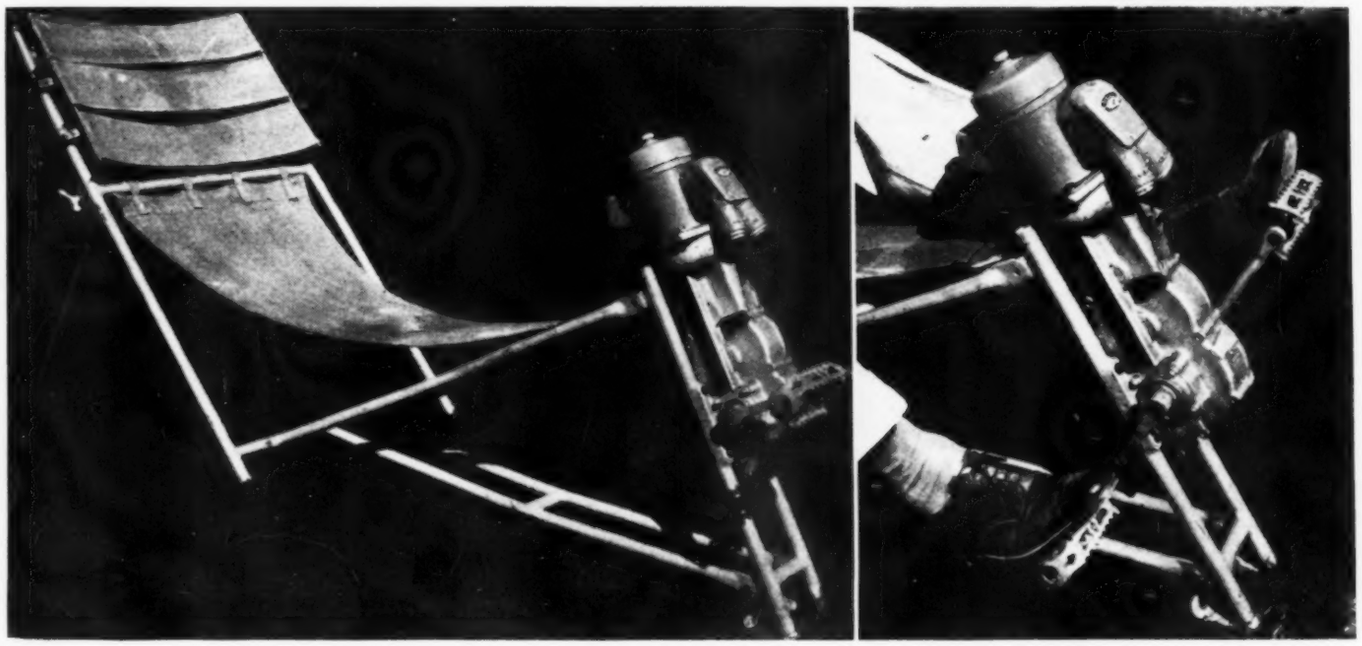
WIRE CASE

Italian assault wire carrying case. Used by Infantry troops. It is made from natural animal hide and hair. Light in weight, strong and durable and carried in back of shoulders.



PORTABLE SWITCHBOARD

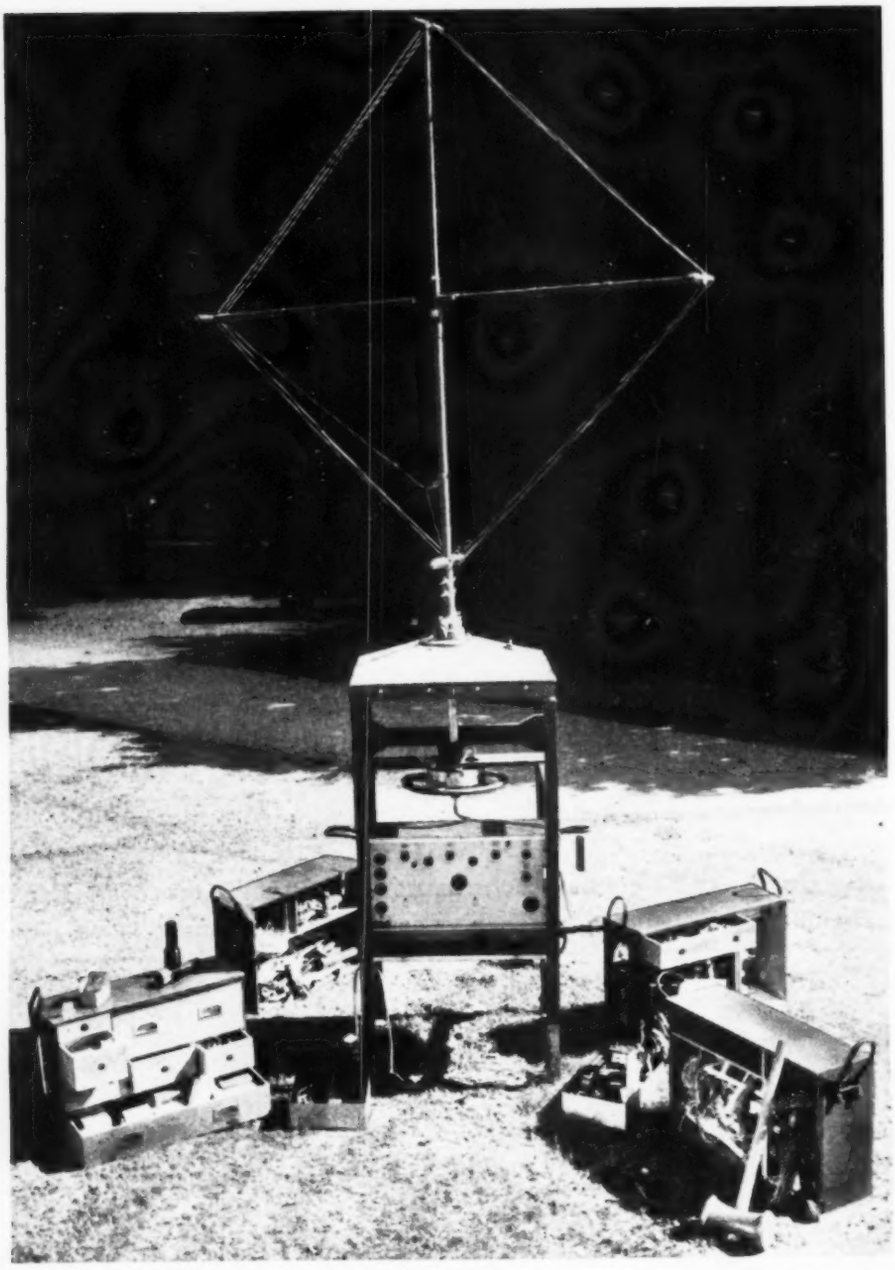
Italian 6-line cordless portable switchboard. Built into a hardwood box. Complete instructions and wiring diagram are included within the cover. Headset slides into compartment. Ringer is on side.



FOOT-OPERATED GENERATOR

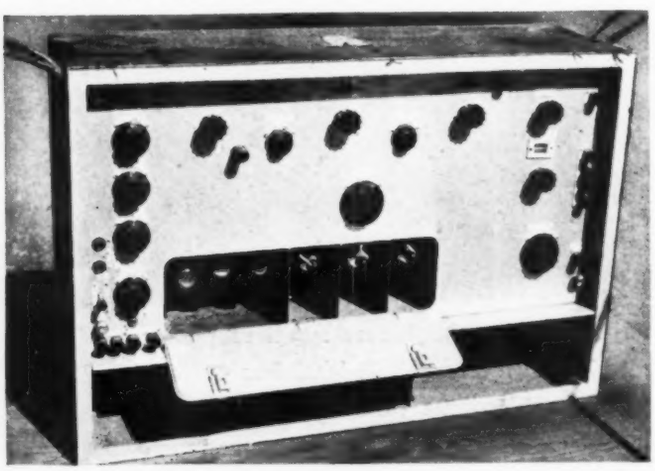
Foot-operated Italian generator supplies power to operate large pack sets. It furnishes outputs of 12 volts for filaments and 400-440 volts for plate supply. Operator is also an aircraft spotter.

JAPANESE EQUIPMENT

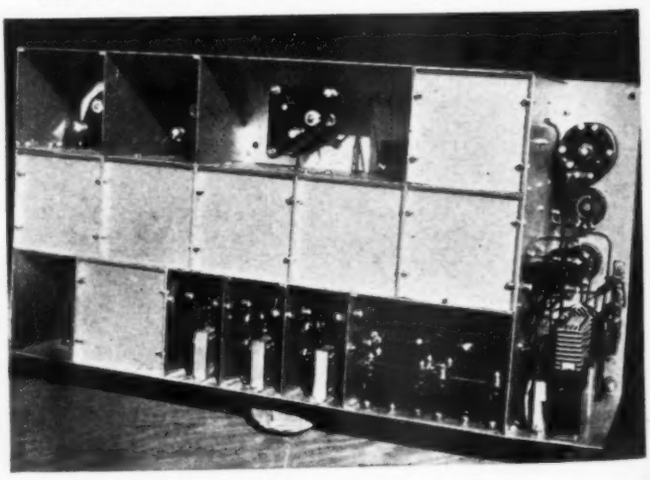


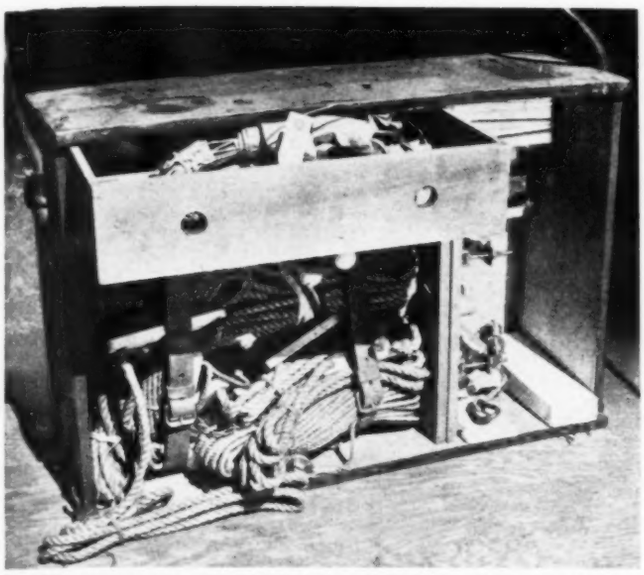
THE Jap Direction-finder shown on these pages is typical of their construction technique. Note the resemblance to American-made units. The Japs are great copyists. In fact—their B batteries are almost identical to the Burgess products as far as appearance is concerned. This assembly was captured in the South Pacific recently. It was never put in operation. The paper was still covering many of the accessories. A large amount of companion pieces are required for the operation of the unit. Ample quantities of spare parts are found in the various cases. Spare paper and mica condensers have both American and Japanese symbols for identification. Tubes appear to be direct copies of ours. The complete unit, set up for operation, requires several troops to handle and to erect antenna towers (when required). The general construction of Jap sets is inferior to those of the Germans. A light weight metal (aluminum, etc.) is employed to reduce the over-all weight. Castings are avoided—the choice being to use individual metal pieces, bolted together with screws.

Front view of the receiver. Six tubes are in compartment.



Rear of receiver. Note the small C battery—copy of Burgess.

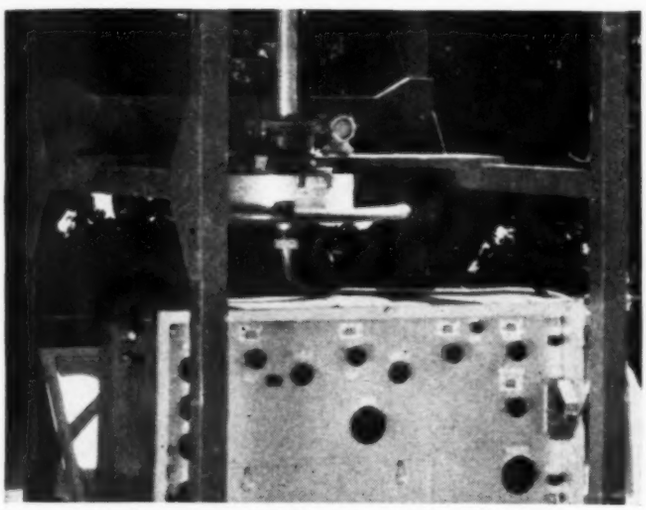




This accessory case includes rope to support antenna masts.



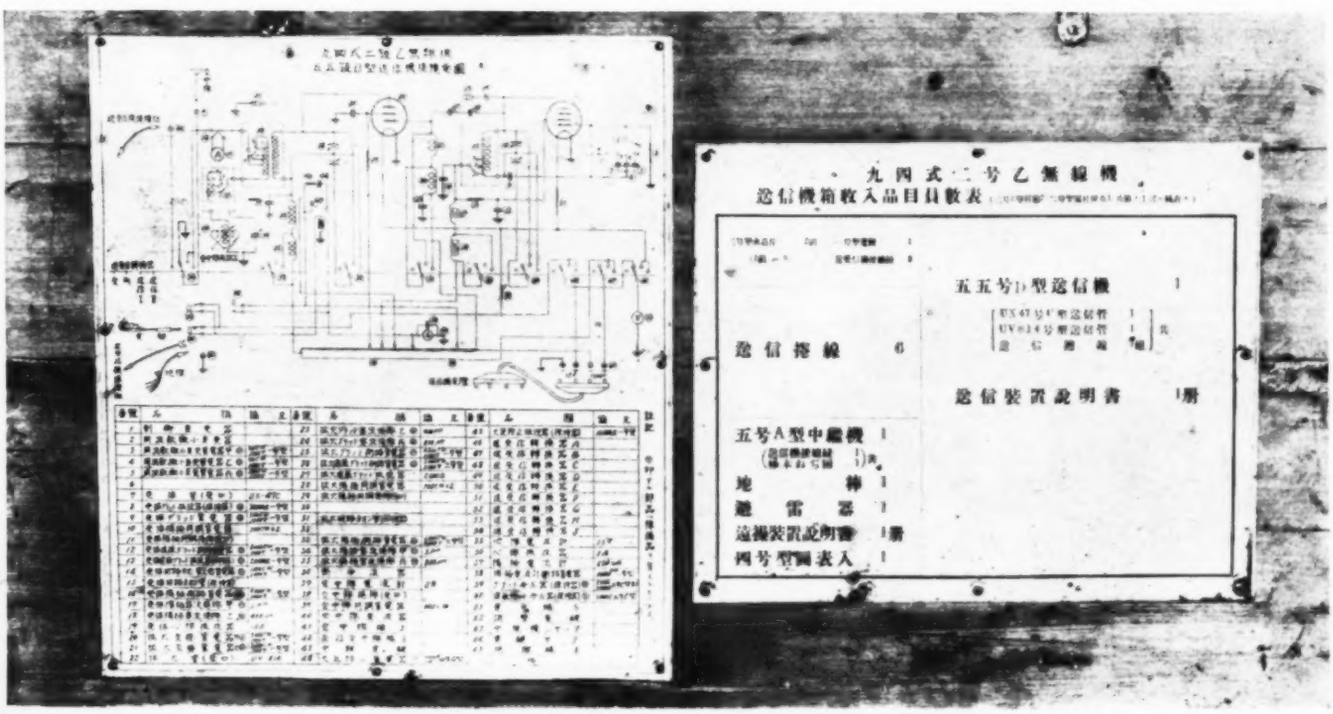
Tubes, insulators and small parts complement this case.



Azimuth circle is directly under frame below loop.

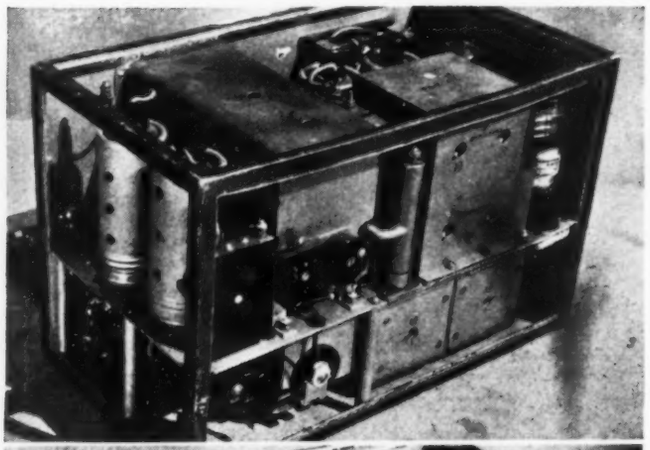


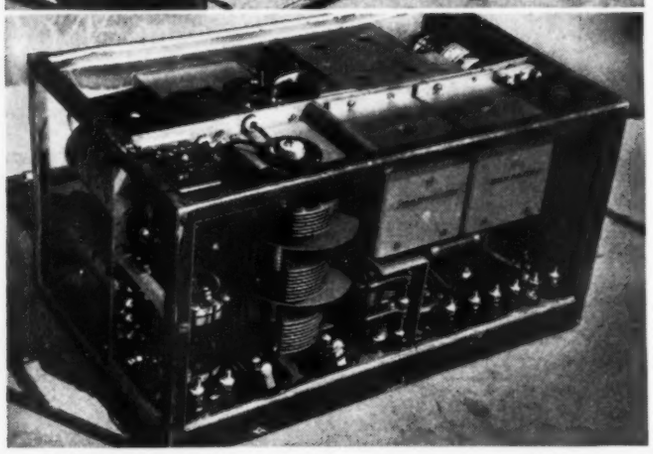
Heavy-duty soldering irons, ant. wire and supports.



Wiring diagram and parts list for the direction-finder. Chart on left shows position for the storage of spare parts.

MISCELLANEOUS CAPTURED EQUIPMENT

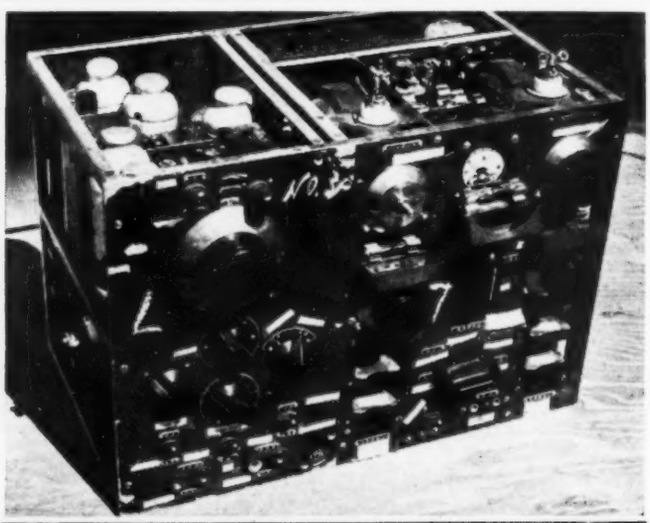


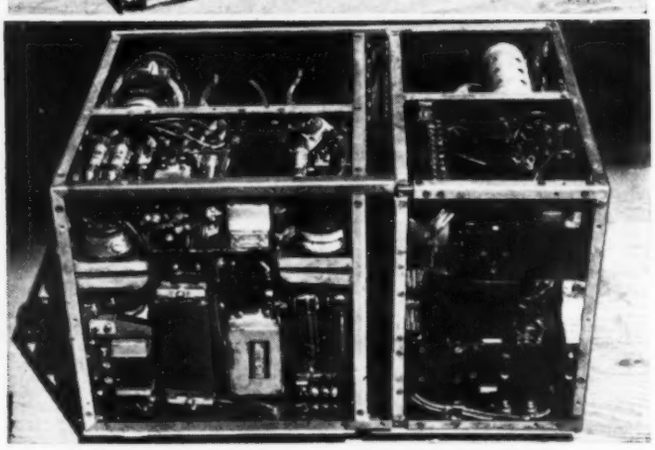


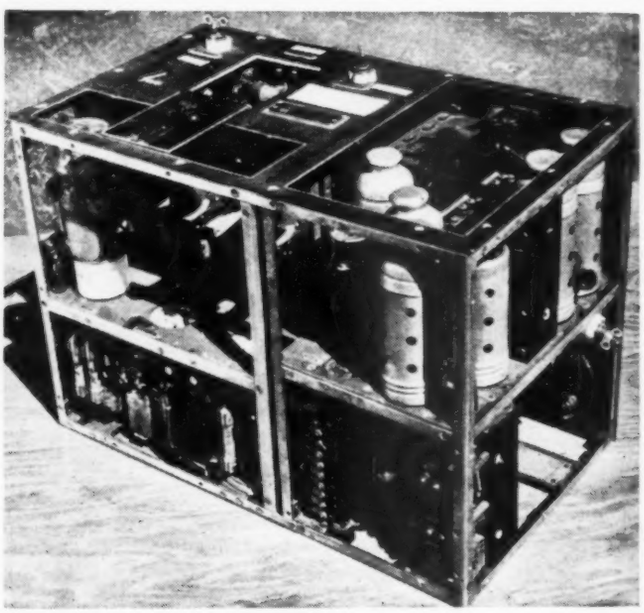


TYPE 13 TRANSCEIVER

One of many captured Japanese radio sets taken from Mitsubishi dive-bomber. This transceiver is designed for 140 and 275 kc. communications.

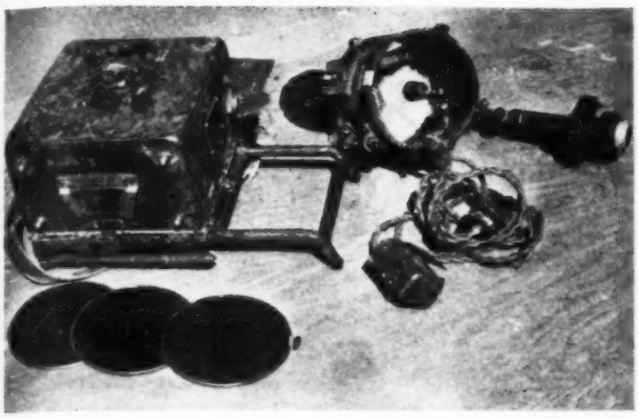






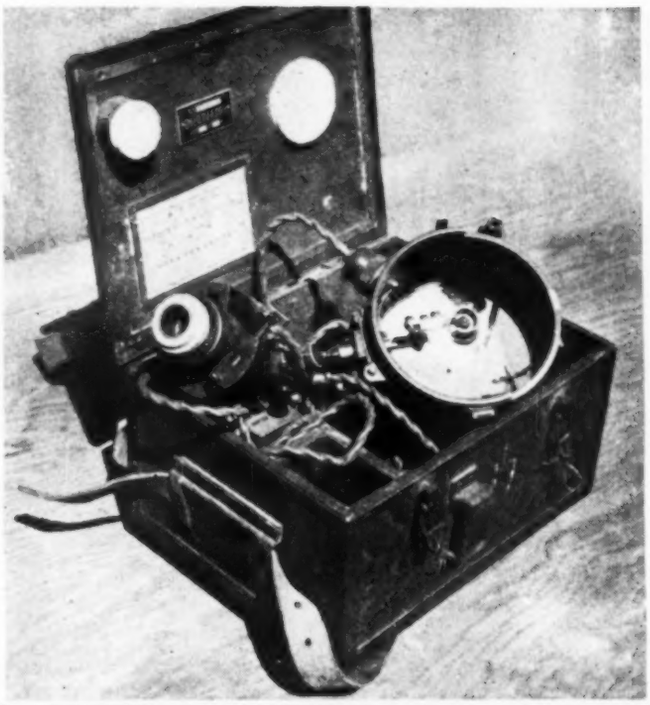
JAPANESE XMTR.-RECVR.

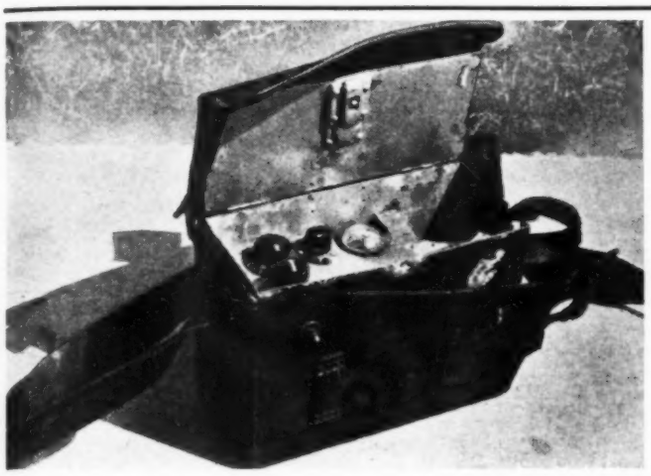
A separate vernier may be seen below the large silvered tuning dial on the receiver. Another control is marked "short-wave, long-wave." Note the small opened fuse compartments on the Xmtr. panel. Fabricated frame gives poor support to unit.



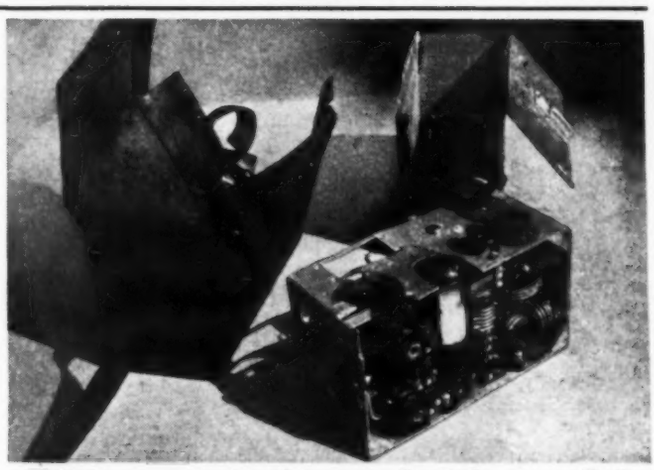
PORTABLE SIGNAL LAMP

Well-constructed signal lamp for blinker code. Discs of different colors are carried in the wooden case. Small, auto-type lamp gives good brilliancy. Complete instructions are listed on the cover. Reflector is silvered glass.

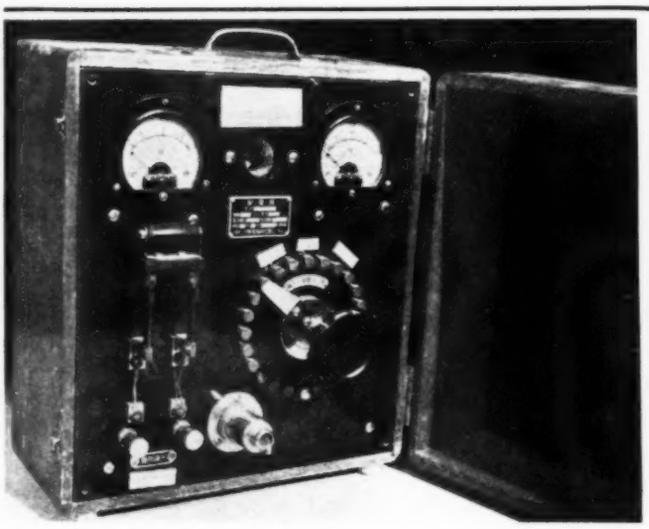




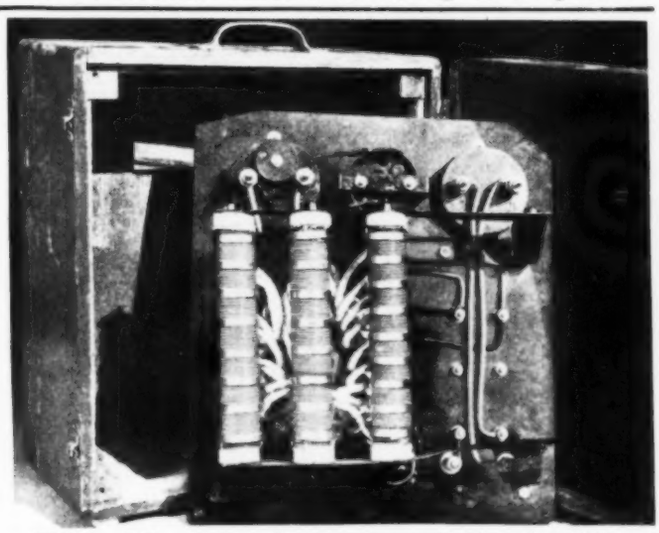
1-TUBE TRANSCEIVER



This tiny transceiver has very limited range. Soft aluminum box—easily damaged—has direct effect on calibration when distorted by twisting, etc.



CHARGING PANEL



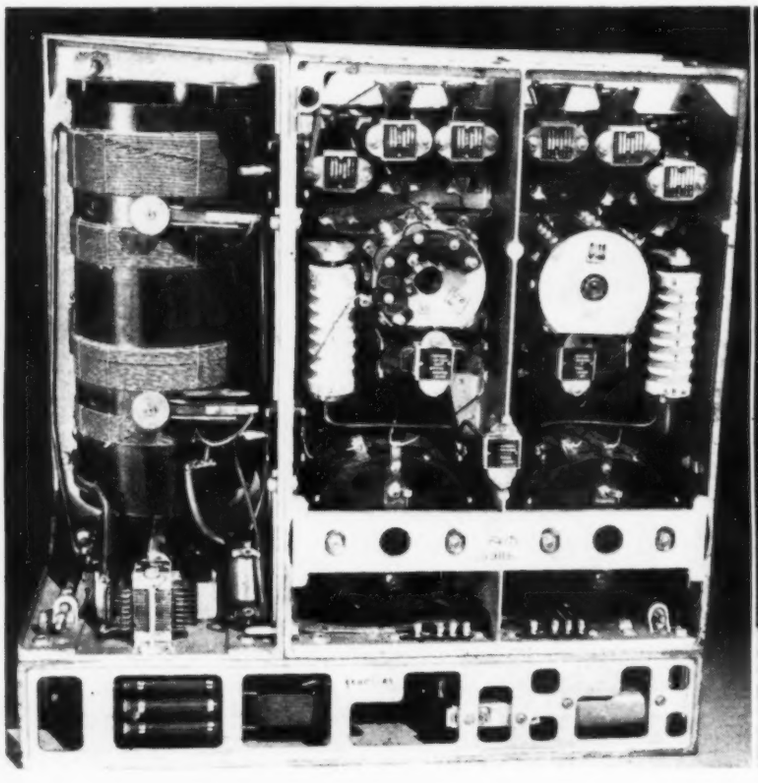
Kihako-3 Japanese charging panel. Rated at 100v. maximum @ 5 amperes. Tap-switch nameplate reads as follows "descent-voltage-ascension."

GERMAN 100 W.S. TRANSMITTER

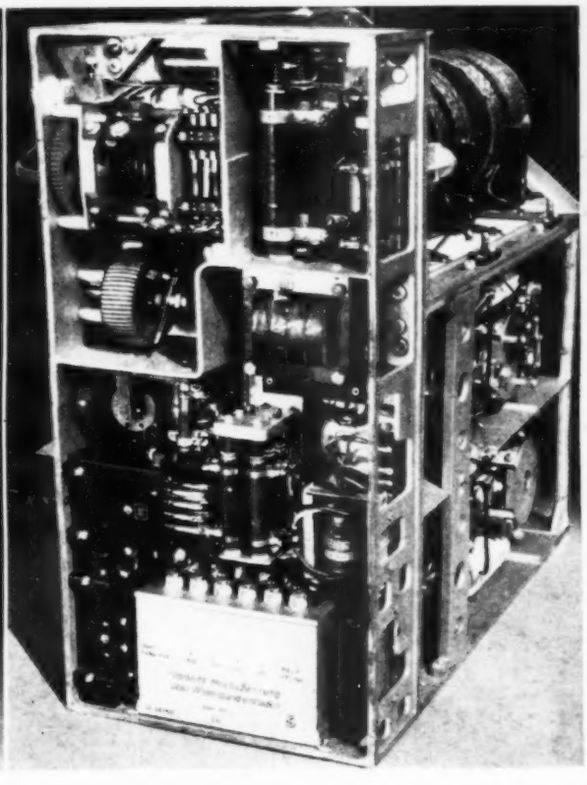
Military version of 100-watt commercial transmitter built by Lorenz. Using three tubes – it operates on both phone and CW

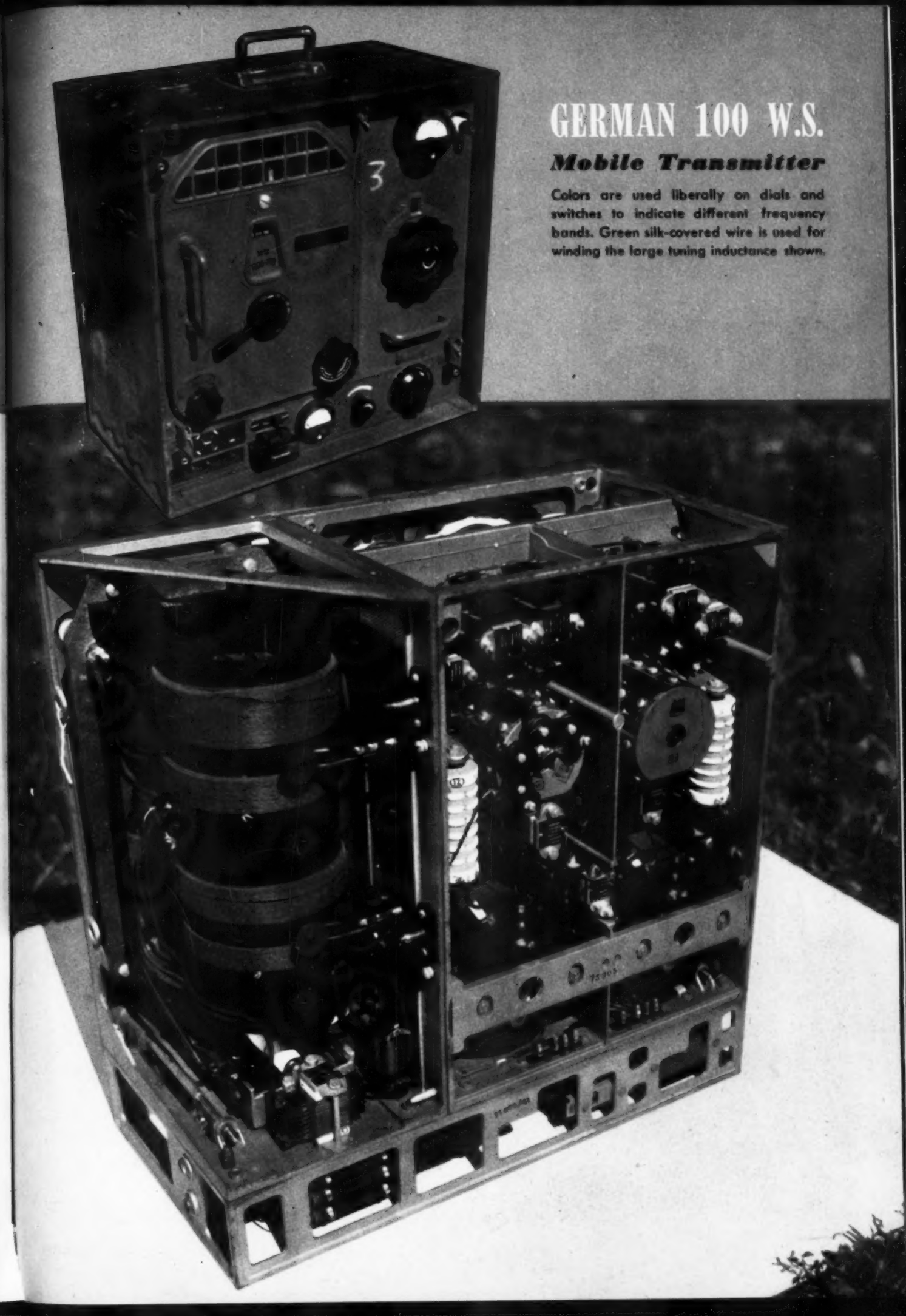
THIS transmitter is exceptionally well built. It is used in vehicles, as a fixed station transmitter and for the transmission of radiophotos. It covers a frequency range of from 200 to 1200 kilocycles on CW or phone. Provision is made for both local or remote keying. Like other German equipment—this set does not use crystal-control. It is designed to be used with a 30 ft. vertical antenna with umbrella top (to increase low angle radiation), an open wire, a roof antenna or an 18 ft. rod. A dynamotor, type U100A is used when operating in mobile units. For fixed station use—a machine type C furnishes power. A source of 12 volts @ 7.3 amperes, and a plate supply of 1000 volts @ 300 ma. is required. Provision is made to reduce the 100 watt output to 10 watts when limited range is desired. A total of three tubes is employed: two RS 237 transmitting triodes (M.O. and P.A.), and one type RS 241 (modulator). The weight of the transmitter is 57 lbs. and the type N-100 dynamotor is 48 lbs. Asbestos-covered shock absorbers may be seen over the three tubes. They hold the tubes firmly in the sockets. Mica condensers are used liberally throughout this set. Some of the assemblies are stacked two and three inches thick. They are made in higher capacities than those of American design. Metal castings are to be found in most German sets. Lightweight metals, such as aluminum, are well made and durable. Soldering and cabling is done neatly. Terminal blocks of bakelite or hard rubber are used. The variable condensers in the 100 W.S. are of good quality. Ball-bearings support the end of the rotor shafts. Heavy tie bars prevent de-tuning of circuits from mechanical distortion.

Rear view of the 100 W.S. transmi'ter. The large inductance is patterned after the variocoupler used in early receivers.



Bottom view showing neatly-arranged parts and general type of mechanical construction employed in German radio equipment.





GERMAN 100 W.S.

Mobile Transmitter

Colors are used liberally on dials and switches to indicate different frequency bands. Green silk-covered wire is used for winding the large tuning inductance shown.



Signal Corps personnel receiving practice in semaphore communications with Navy men.



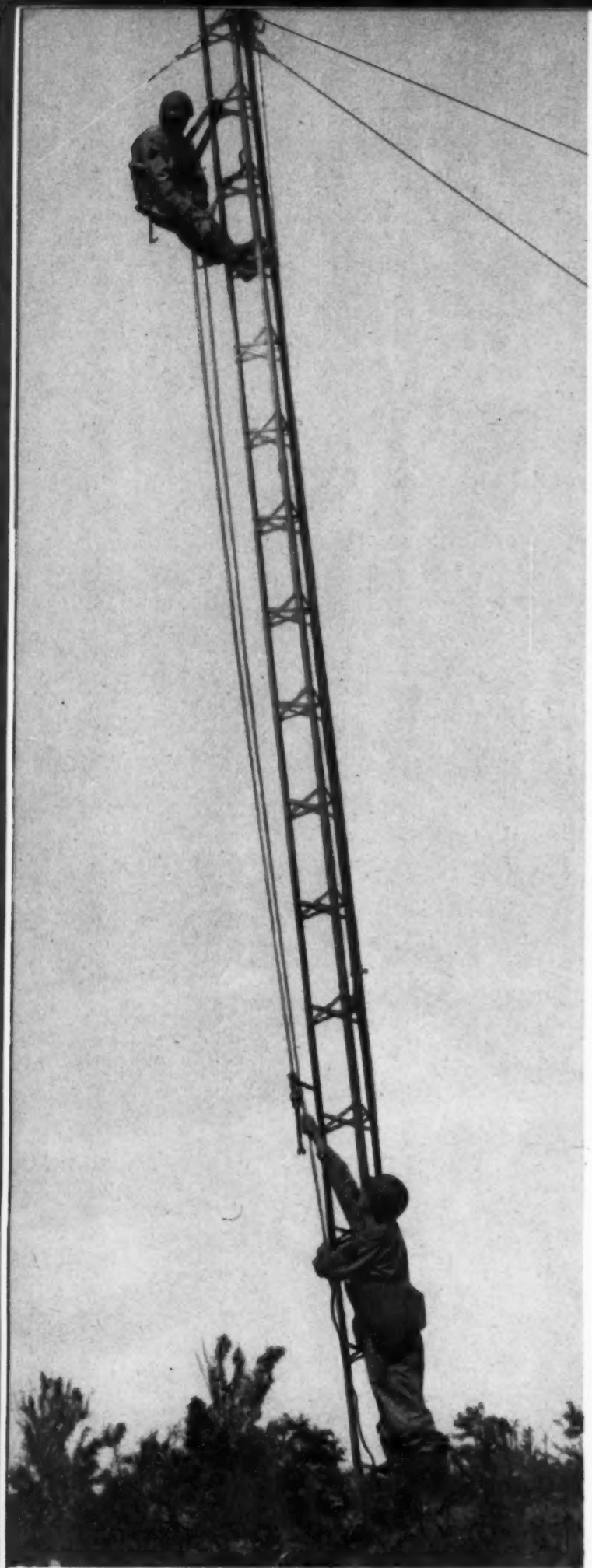
Wearing gas mask—this photographer of the Signal Corps prepares for an action shot.



Preparing a studio set for the taking of a training film. Note "mike" above lantern.



Experts of Army Pictorial preparing an indoor set for simulated jungle warfare sequence.



Signalmen erect light-weight steel antenna tower—used to support elaborate systems.



Crossarm being installed on pole by students of the long lines outside course, Ft. Monmouth.



Diversity receiving station. Each of 3 receivers is fed by a rhombic antenna—each pointing in a different direction.



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GOVERNMENT PRESCRIBED PRINTING

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MILITARY TRAINING

The Signal Corps has adopted methods of training that are producing the finest of radio operators.

By Colonel FLOYD T. GILLESPIE



Born in Sturgeon Bay, Wisconsin, in 1892. Attended University of Southern California and is a graduate of the Infantry School, 1922; the Signal Corps School, 1926. During last war served with the AEF and Army of Occupation. Was Officer in Charge of the Wire Division, Signal Corps School, 1933, and Assistant Signal Officer, Hawaiian Department, 1939. In 1942 was assigned as Assistant Chief Signal Officer, Allied Force Headquarters, North Africa, from which duty he was assigned to his present position as Chief of the Military Training Branch.

WITH commanders on the world battlefronts stressing more and more the importance of communications to the successful completion of their mission, the job of training Signal Corps personnel becomes increasingly vital—and also more complex.

In our present-day accelerated warfare, personnel are continually facing changing demands and new techniques. Each theater of operation has its own peculiar, unprecedented problems, and the training of men to cope with these problems and to maintain efficient communication systems under any conditions—jungle, desert or mountain—obviously calls for a versatile and ever-changing program.

Many deficiencies were encountered in the first operations of the war, but the training program of the past year has been principally directed at correcting these shortcomings by benefiting from experience. To this end, efforts are being made to have officers and enlisted men return from theaters of operation to aid in the training of personnel.

The transformation of a civilian into a capable, highly-trained enlisted man or officer, ready to take to the field against an enemy, is a task of many phases. The goal is two-fold, for Signal Corps soldiers must be skilled at both combat and communication techniques. As an indication that the men stringing wire, operating radio sets, etc., are expected to do more than just that, the table of equipment of a division signal company allots the organization six Browning machine guns, .50 caliber; 32 submachine guns, .45 caliber; 148 carbines; 45 grenade launchers; five anti-tank rocket launchers; and 45 rifles, .30 caliber.

Obviously the Signal Corps soldier is trained not only in the maintenance and operation of his equipment, but is also a good all-around combatant. He is thoroughly acquainted with his weapons; knows camouflage, scouting, patrol, and map and aerial photograph reading; he is able to protect himself and his equipment from gas, air and mechanized attack.

After achieving a degree of proficiency in his specialty, the individual is then trained to become a member of a smooth, efficient team. And, at every opportunity, the training program must be made realistic. Men must be steeled against the shock of initial contact with the enemy. They must be prepared to take the step from handling practice signal traffic to handling real signal traffic upon which lives will depend.

All the various types of Signal Corps specialists are taught to operate under simulated battle conditions. For example, radio operators go through an intensive training period to increase their ability to copy through noise and interference; truck drivers undergo a series of tactical problems, during which nitro-starch charges are automatically detonated, showering dirt and debris on the vehicle.

Signal Corps military training can be grouped into three categories—Enlisted Men's School, Officer Candidate School, and Officers School.

Soldering transmission wires on a rhombic antenna prior to hoisting on large telephone pole.





Camouflaged message center during maneuvers near Fort Monmouth.



SCR-609, FM radio transmitter and receiver during field operations.

From civilian to qualified Signal Corps soldier is a series of integrated steps beginning at the Reception Center. At the Reception Center, information pertaining to a man's work, history, and educational background together with his scores on the General Army Classification, Mechanical Aptitude, and other tests are entered on his Qualification Card (Form No. 20). The classification officer uses this information in making assignments to the different arms and services. Arriving at a Signal Corps Replacement Training Center, a soldier is sent to Personnel Testing Headquarters where by interview, review of his Qualification Card, and his aptitudes, as determined by the two basic Signal Corps examinations (Radio Telegraph Operator Aptitude Test and General Electrical Information Test), he receives his assignment for specialized training or to a technical Signal Corps job.

Signal Corps training of enlisted men is now conducted primarily at the Eastern, Central, and Western Signal Corps Training Centers, the Southern Signal Corps School, and the Signal Corps Photographic Center.

The Eastern Signal Corps Training Center, Fort Monmouth, New Jersey, has a Unit Training Center and a School. The Central Signal Corps Training Center, Camp Crowder, Missouri, is composed of a Unit Training Center, a Replacement Training Center, and a School. The Western Signal Corps Training Center has a Replacement Training Center at Camp Kohler and a School at Davis, California. The Southern Signal Corps School, Camp Murphy, Florida, specializes in training officers and enlisted men in installation, maintenance and operation of more advanced electronics equipment. The Signal Corps Photographic Center is located at Astoria, Long Island, New York, and trains officers and enlisted men in various photographic activities.

The facilities of various schools—both vocational and those operated by manufacturing concerns—have been utilized extensively in the Signal Corps training program on a contractual basis. While this program has been sharply curtailed as service schools become ready to assume the load, some training of this type is still being conducted for special types of equipment.

Signal Corps Replacement Training Centers are composed of several training battalions, whose mission is to train the newly inducted man in the military essentials every soldier must know. Here he learns the drills and movements which give a unit cohesion, precision, and the individual poise and bearing. He also learns to take care of himself and his equipment. He is taught military courtesy and discipline and to realize that without them his organization would be just a mob and not the smooth-working, highly efficient team each military unit must be in order to accomplish its mission. It is here that instruction is first given in rifle marksmanship and basic signal communication.

The following specialists are trained in the Signal Corps Replacement Training Centers: Aircraft warning plotter, automobile mechanic, clerk-typist, and personnel clerk, cook, draftsman, field lineman, lineman telephone and telegraph, message center clerk, messenger, pigeoneer, radio operator (low speed), stock control clerk, and supply clerk, telephone switchboard operator, teletypewriter operator, and truck driver.

Signal Corps personnel required for tactical units include a wide range of specialists, who receive their individual technical training, primarily, in a Signal Corps School. Some of these specialties are cable splicer, central office repairman, communications chief, telephone installer-repairman, plotting board air warning installer-repairman, powerman, telephone repeaterman maintenance, telephone switchboard installer, teletypewriter installer-repairman, central office wire chief, field wire chief, intercept operator, radio intelligence control chief, fixed station radio operator, high speed radio operator, and radio repairman.

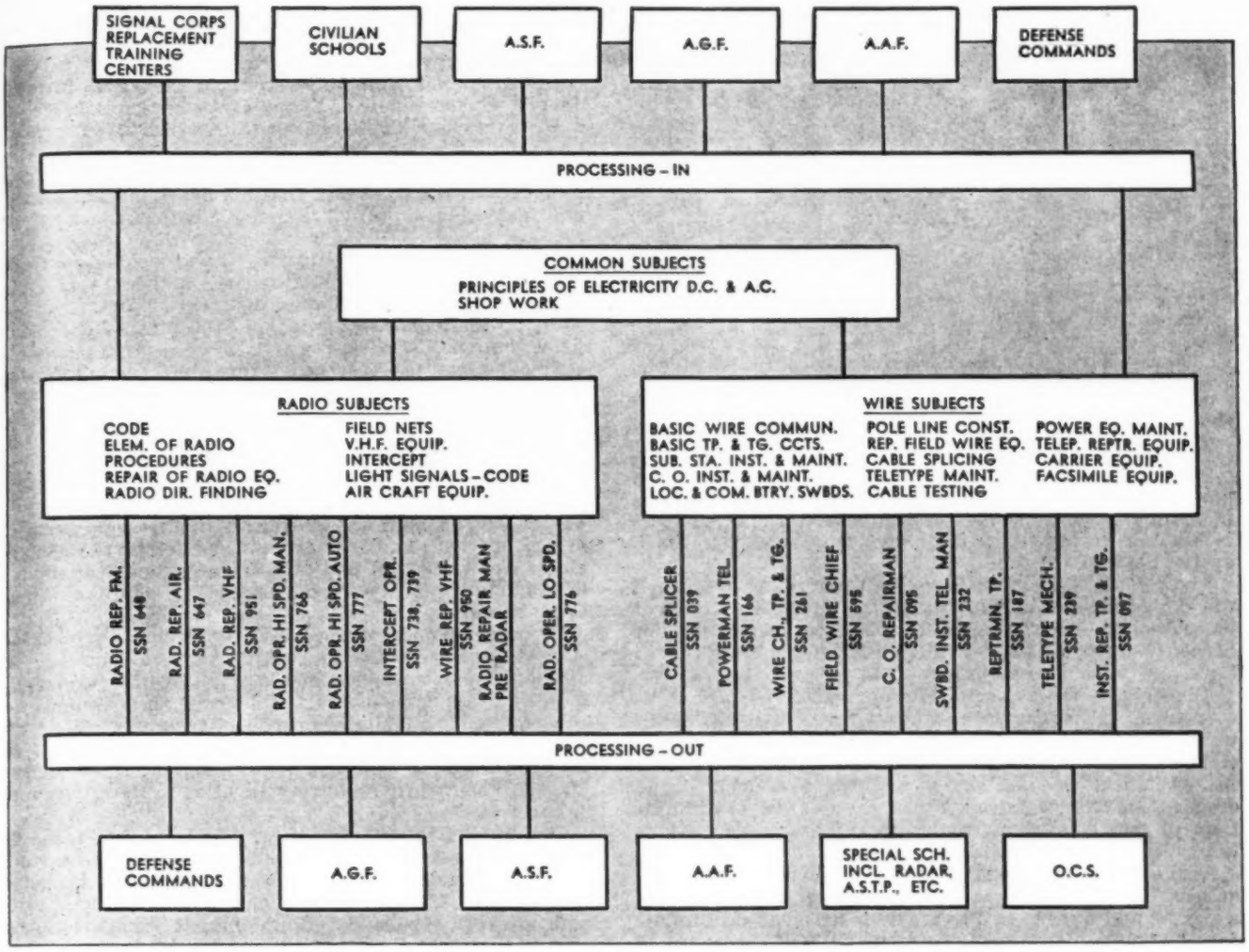
The vocational method of training is employed in the enlisted men's courses. The students are taught correct principles and methods and the associated practical application, with the greater part of the instructional time devoted to practical work covering the equipment on which the student is receiving training. When a student has successfully completed a given phase of instruction, he is permitted to progress to a more advanced phase. The rate of progress depends upon the ability of the individual student and not upon the class as a group.

In each subcourse the student is given frequent quizzes and progress tests and at the end of the course is required to take a final examination and performance test. A minimum grade of 70% is required to complete satisfactorily each subcourse.

A student who, by virtue of his education or previous experience, demonstrates knowledge of any subcourse may be exempt from all or part of the work required to complete that subcourse and quickly pass on to the next one. Thus a student may finish his work as quickly as possible and be available for the next phase of his training.

Each student is rated in each subcourse by his instructors on his aptitude, military bearing and neatness, attention to duty, tact, conduct, intiative, intelligence, and dependability. The standard ratings for each quality are the

STUDENT FLOW CHART—ENLISTED MEN
SIGNAL CORPS SCHOOLS



standard War Department Efficiency Report ratings of: Unsatisfactory, Satisfactory, Very Satisfactory, Excellent, and Superior. These individual ratings form the basis for the final rating given each man and entered on his Qualification Card when he leaves the school.

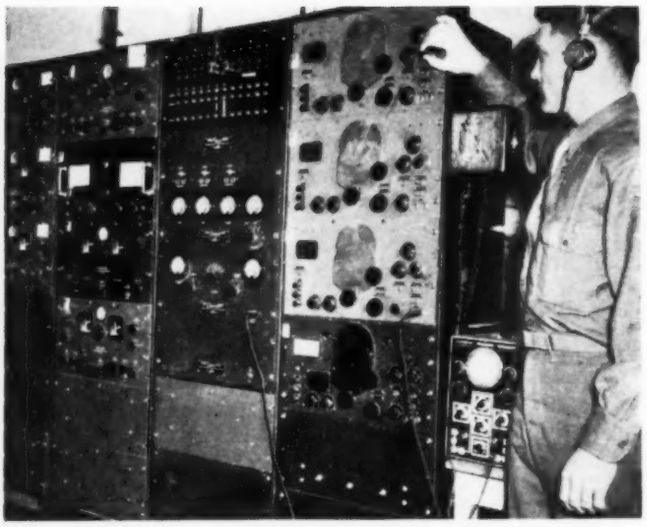
Upon satisfactory completion of the required course, the specialty and the degree of proficiency therein—skilled, semi-skilled, or potential—is recorded for each student on his Qualification Card. His general efficiency rating as a soldier for the school period is also shown. A record of

Artillery-fire direction center where students are taught firing techniques.



Handie-talkie communications.





Student is taught operation of a remote receiving station.

partial training is made in cases where a student has completed his major subjects and is unable, through no fault of his own, to remain at the school long enough to finish every subject.

The Signal Corps Unit Training Centers are organized for the activation and training of Signal Corps tactical organizations. The units are formed from men trained in Signal Corps schools and men from Reception Centers who have had no service training.

The first six weeks are devoted primarily to basic military training. From the seventh through the fourteenth week emphasis is placed on technical training in that specialty to which the individual soldier has been assigned. All specialists are familiarized with the component parts, description, correct nomenclature, capabilities and limitations of their equipment, and with any operating precautions which may be necessary.

At the end of this period the soldier should be qualified, at least as an apprentice, in the specialty to which he is assigned, and be able to operate with sufficient skill to undertake training as a part of a team without disrupting it by lack of proficiency in his particular work. The fifteenth through the seventeenth week is devoted to a Field Training Period.

The individual continues to gain skill in his specialty by his continual exercise of it but the emphasis on training is upon fitting the individual into a smoothly working team. When the newly organized unit completes its training, it is sent to the theater which requires the technical services of that particular type of Signal Corps unit.

The structure of a Signal Corps unit is determined by the mission it is to perform. The most common types and the mission of each is as follows:

Signal Company, Infantry Division—furnishes communications for Infantry Division headquarters, forward and rear echelons; provides communications down to regiment.

Signal Battalion—furnishes communications for Corps or larger headquarters; maintains signal supply dump.

Signal Wire Operation Company—installs operators and maintains wire communications within forward and rear echelons of larger headquarters.

Signal Battalion, Construction—generally used to construct the main wire and cable facilities between higher headquarters and their installations.

Signal Photographic Company—provides still and motion pictures for purposes of news, history and training.

Signal Pigeon Company—pigeon communications; Army down to regiment.

Signal Troop, Cavalry Division—furnishes communications for Cavalry Division headquarters, forward and rear echelons; provides communications down to regiment.

Signal Company, Armored—furnishes communications for Armored Division Headquarters, forward and rear echelons, provides communications down to regiment.

Signal Radio Intelligence Company—interception and location of enemy radio facilities; monitors friendly stations.

Signal Mobile Photographic Laboratory Unit—provides facilities for processing film (motion picture and still).

Signal Operation Battalion—provides communications for Army and higher headquarters.

Signal Depot Company—stores, issues and furnishes fourth echelon repair of Signal Corps equipment.

Signal Repair Company—provides third echelon repair and maintenance of Signal Corps equipment.

Signal Company, Mountain Division—furnishes communications for Mountain Division headquarters, forward and rear echelons; provides communications down to regiment.

Signal Port Service Company—provides communications for ports; carries on repair, storage and issue, receiving and shipping of Signal Corps equipment at port.

Signal Photomail Organization—operates V-Mail and official photomail service.

Signal Company, Airborne—furnishes communications for Airborne Division headquarters, forward and rear echelons; provides communications down to regiment.

Definite minimum prerequisites have been established for admission to the Officer Candidate School.

The following qualifications are considered essential in an application for pursuing the prescribed course of study: (1) at least a high school education, (2) some practical experience with radio, telephony and telegraphy, supply, motor transportation, photography, or pigeons, (3) interest in communications or some particular phase of Signal Corps work.

Preparation for entrance into the Signal Corps Officer Candidate School falls into several general phases. The development of a Signal Corps specialty will depend on the individual assignment of the enlisted man. A number of enlisted men in the Signal Corps who lack practical experience in radio or wire communication have found it advisable to request assignment to a course in the Enlisted Men's School before making application to the Officer Candidate School.

Objective of the Officer Candidate School is to teach the candidate the fundamental knowledge required to perform efficiently his duties as an officer. The officer candidate should have demonstrated his capacity to direct, control, and influence others in definite lines of action, either in civil life or in his army career, and is required to demonstrate proficiency which indicates that he can perform the basic duties of a second lieutenant.

The Officers' School at Fort Monmouth, N. J., offers the following courses: Officers' Basic Military Training; Company Officers' Common Subjects; Electrical Fundamentals; seven specialty courses, namely Administration and Supply, Motor Transport, Long Lines Outside Plant, Long Lines Inside Plant, Division Field Wire, Radio Communication and Message Center Officer; Officers' Combat Training; Advanced Officers' Signal Supply Survey, and Advanced Officers' Course.

All officers, upon completion of any of the seven specialty courses, are required to take the Officers' Combat Training Course prior to assignment to the Officers' Replacement Pool or to a tactical unit.

The Officers' Basic Military Training Course is a four weeks' program designed for commissioned officers who have not previously completed a course in basic military subjects or who have not had such training within a reasonable period of time. To the newly commissioned officer it presents the ground work upon which may be based future military schooling, or if he is assigned directly to a tactical unit, it aids him in accomplishing his mission efficiently and confidently. To the company and field grade officer, it presents the opportunity of reviewing those basic concepts of soldiering necessary to all officers. This course covers the rudiments of basic soldiering to which have been added the lessons of the present war.

Graduates of the Officer Candidate School and the Company Officers' Common Subjects Course may receive tactical assignment or be placed in an Officers' Signal Corps Replacement Pool. Some of these graduates will go di-

(*Continued on page* 441)

VISUAL AIDS



Class in Subscriber Station Maintenance. Students clear trouble on demonstration boards shown in background.

Study is the hardest kind of work for many men, especially older men entering through Selective Service. Visual aids simplify study.

By Lt. Col. E. A. REDDING, Jr.



Born in Ohio, 1900 and served with the AEF in World War I. He served in various Signal Corps enlisted ranks in the Regular Army; was called to active duty under his reserve commission in 1940. He was Officer in Charge of the Aircraft Warning Service, Panama Canal Department, until 1941, when he was assigned to the War Plans and Training Division, Office of the Chief Signal Officer. In 1924 he was with the Literature Branch, Military Training Division, Office of Chief Signal Officer, and in October, 1943 was appointed as Chief of the Publication Branch.

IN ITS preparation for World War II—a preparation job which is now over its hump, but still going strong—the Signal Corps has been faced with the problem of training thousands upon thousands of men to service and maintain the Army's communication equipment.

It has been necessary to train these men both well and fast. With the army growing in leaps and bounds and with equipment being turned out by the billions of dollars worth, it has been necessary to train technicians in proportionate numbers. In the beginning the ranks of maintenance men were expanded by enlistment of radio service men, hams, and radio experimenters from civilian life, many of whom required relatively little training to fit them for this work in the army. But this source of supply was soon exhausted. Then there was nothing for the Signal Corps to do but to select from among inductees those who were interested in radio, or who showed aptitude in this direction, and train them right from basic fundamentals through to a comprehensive understanding of principles and practice.

Too much credit cannot be given to the men who have gone through this Signal Corps training program nor to the men who have served as their instructors—many of the latter men who had themselves completed the training only recently and who, because of exceptional qualifications, educational background, and a firm grasp on the subject, were selected to help train others. It is no fun for anyone to spend in the vicinity of eight hours per day, six days each week, in concentrated study of a single subject. Particularly so when in addition there are hours of military training and duties before or after school hours.

For many, study is the hardest kind of work; especially the many older men who come in under Selective Service and perhaps had been out of school for a decade or more.

It was to help in all this that training aids have been very extensively adopted throughout the Signal Corps technical schools. It is recognized that to study abstract theory from the pages of a book is a difficult matter. Lectures and laboratory periods help tremendously but it has been found that training aids, by means of which students can *see* demonstrations of the principles studied, have not only speeded up the process of training but have resulted in students gaining a clearer understanding of many of the basic principles on which their study of radio is founded.

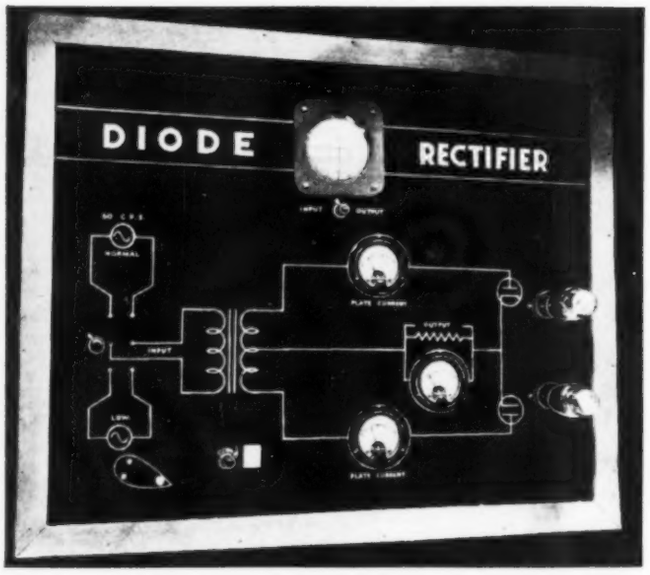


Fig. 1. Panel layout of the diode rectifier demonstrator.

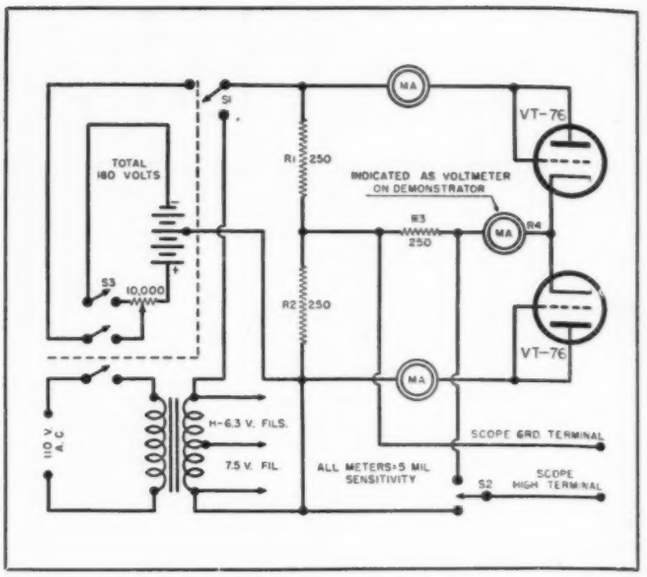


Fig. 2. Diode rectifier circuit as wired behind the panel.

The training aids are of two general types. Movies, charts and mock-ups constitute the first type. Every Signal Corps school boasts an extensive film library with films covering substantially every phase of every subject that lends itself to this type of showing. Charts, large circuit diagrams, posters, and other forms of wall-mounting aids are posted at all schools, many of them of local origin. Mock-ups are models of equipment or equipment installations which simulate actual installations. For example, a mock-up of an aircraft radio installation might consist of a wood structure which duplicates the inside of a plane, in full size, with the radio equipment mounted exactly as in a real plane. This gives the student a much more accurate idea as to the problems he will face when later it may be necessary for him to actually service real installations. Many things in his training will be made clearer to him when he has seen such a "mock-up" rather than having to depend on his imagination to picture the installation represented.

But the subject of this article is the second general type of training aids which really have no clean-cut designating name. They fall under the general head of "Visual Training Aids"—but so do the aids of the first type mentioned above. Among the students and instructors in the schools these aids to be discussed are more commonly known as "gadgets" to distinguish them from other forms of training aids. For the purposes of this article, however, we will consider them simply as Visual Training Aids.

These aids take a wide variety of forms and employ various means in performing their functions. They may show just what is happening in each part of a vacuum-tube oscillator or amplifier circuit, for example, or visually demonstrate the action of a rectifier tube in the conversion of alternating current into direct current; or they may be so designed as to give the student concentrated practice in some phase of his future work. Again, they may be purely mechanical devices which aid in the explanation of complicated principles. Each of the actual devices to be described here perform one or more of these various functions.

DIODE RECTIFIER DEMONSTRATOR

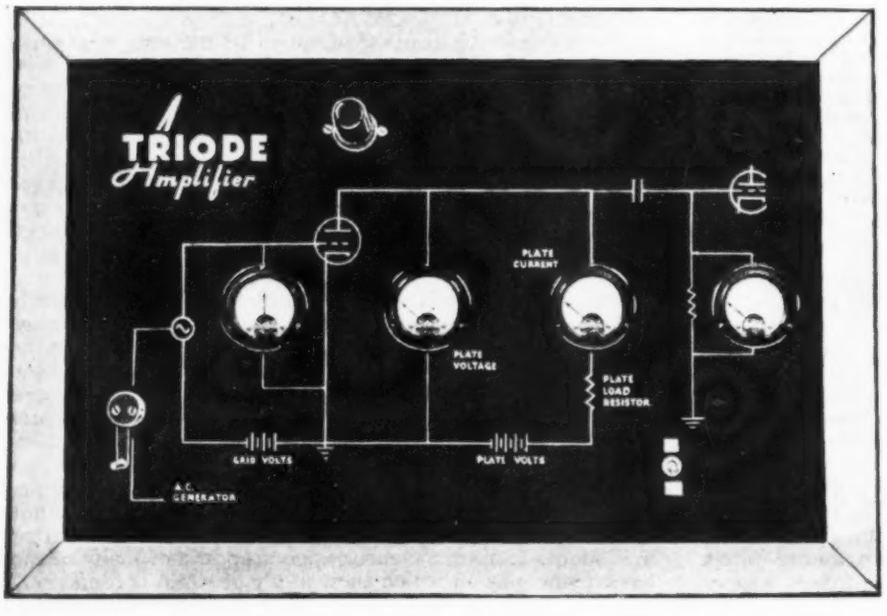
The diode rectifier demonstrator illustrated here is one that was developed at the Southern Signal Corps School, Camp Murphy, Florida, and is used in connection with basic radio and electronic training courses.

In effect, this demonstrator is one which shows on the oscilloscope screen the functioning of a conventional full-wave rectifier circuit utilizing two diodes, with 60 c.p.s. alternating current applied to the circuit; then by means of a small built-in hand "generator" it provides for the development of an a.c. input of such low frequency that the detailed functioning of each diode can be readily followed by the eye. What this amounts to is the conventional showing of the effect of rectification, then a repetition of this demonstration in slow motion so that every detail of the operation can be seen in the action of the meters.

Its purpose is to show students exactly how rectifier circuits function, and thus insure that they thoroughly understand this very basic principle of vacuum-tube operation.

The diode rectifier demonstrator consists of a panel on which is engraved the schematic circuit of a full-wave rectifier, with some of the actual components mounted in such manner as to provide close coordination in the mind of the student between the diagram and the actual components. This arrangement is illustrated in Fig. 1.

Fig. 3. Demonstrator used to show operation of a triode voltage amplifier.



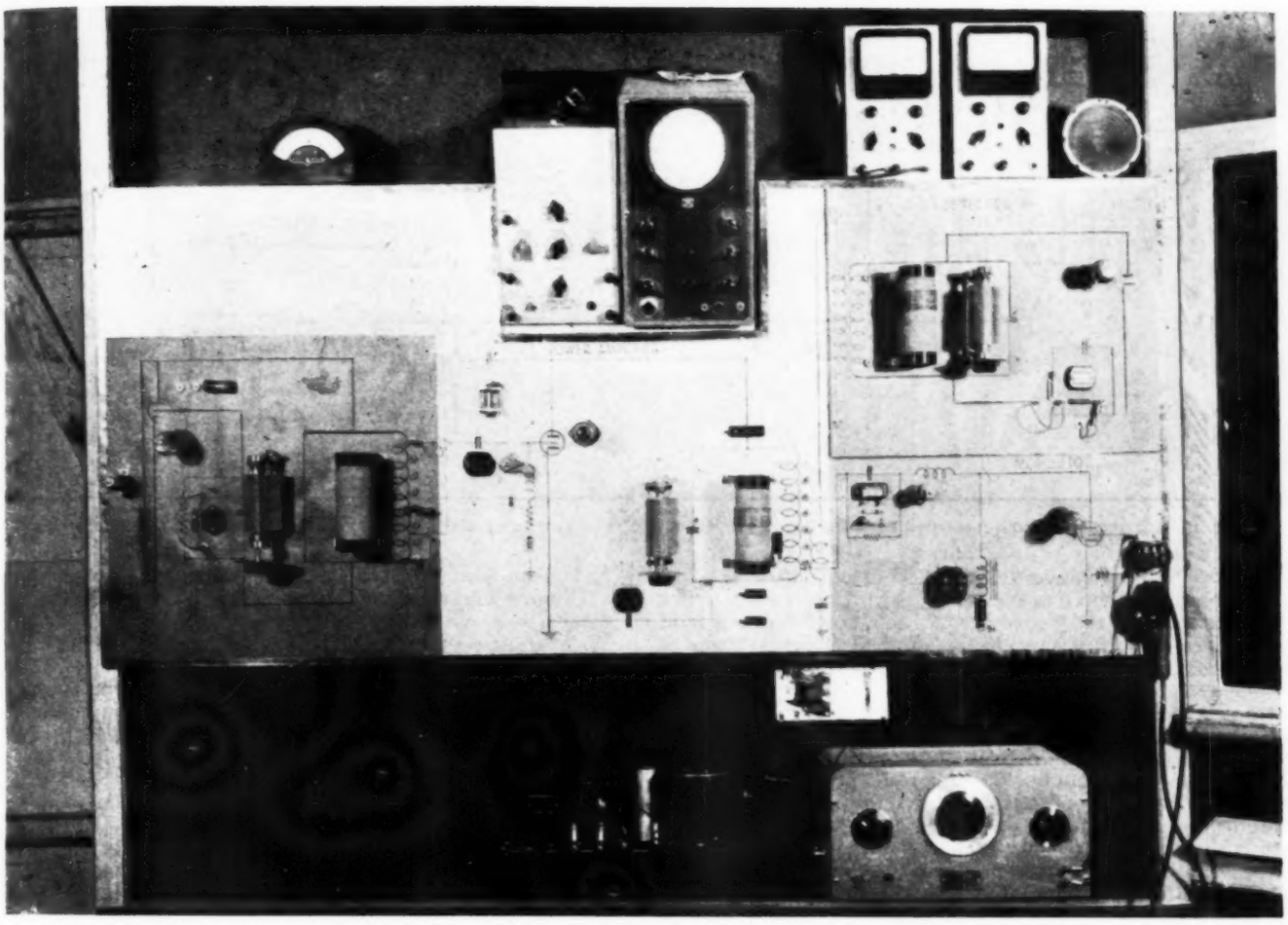


Fig. 5. Front view of low-frequency transmitter. Each section of the transmitter is clearly shown for demonstration purposes.

Fig. 2 shows the schematic diagram of the circuit actually employed. Forgetting for the moment the upper left hand portion of this circuit enclosed in the broken line, it will be seen that the balance constitutes a conventional full-wave rectifier circuit in which the a.c. output of a power transformer is applied to two diodes consisting of VT-76 triodes, with the plate and grid of each tied together. In each diode circuit is a milliammeter and in the load circuit a voltmeter (milliammeter operating as a voltmeter). In this load circuit the multiplier resistor of the meter itself constitutes a portion of the load resistance.

A switch arrangement is provided so that the associated oscilloscope can be connected either across the a.c. input to one diode or across the 250-ohm d.c. load resistor. Thus the 'scope will show the a.c. applied to the diode in one switch position and in the other will show the pulsating d.c. to which this wave has been converted by the two diodes. To study the half-wave rectification, obtained when only one diode is used, it is only necessary to withdraw one of the tubes from its socket.

Turning now to the portion of the circuit enclosed in the broken line, it is found to be a means for generating the equivalent of an alternating current of extremely low frequency which can be applied to the rectifier in place of the 60 c.p.s. supply by the action of the rotary switch S-1.

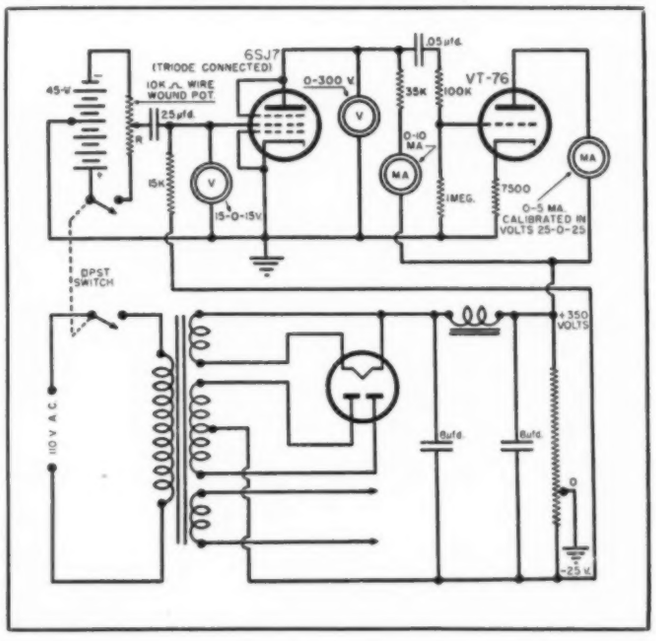
This simulated a.c. voltage is developed by action of the 10,000-ohm potentiometer as it is swung back and forth through its range by a hand-operated mechanical arrangement which will be described later. From a study of Fig. 2 it will be seen that this action makes the plates of the diodes alternately positive and negative in respect to each other, which is exactly the action obtained when supply line a.c. is applied to the circuit.

The switch S-3 is simply a triple-pole, single-throw power switch which breaks both the a.c. line and battery circuits.

In staging the demonstration, switch S-1 is set to connect in the 60 c.p.s. supply and the power switch S-3 is thrown to the lower position. The rectified d.c. voltage can then be read on the voltmeter. The two milliammeters will, due to their inertia, show continuous readings. For the moment these current readings are neglected, however.

The 'scope switch S-2 is now thrown to its lower position.

Fig. 4. Circuit diagram as employed in the amplifier demonstrator.



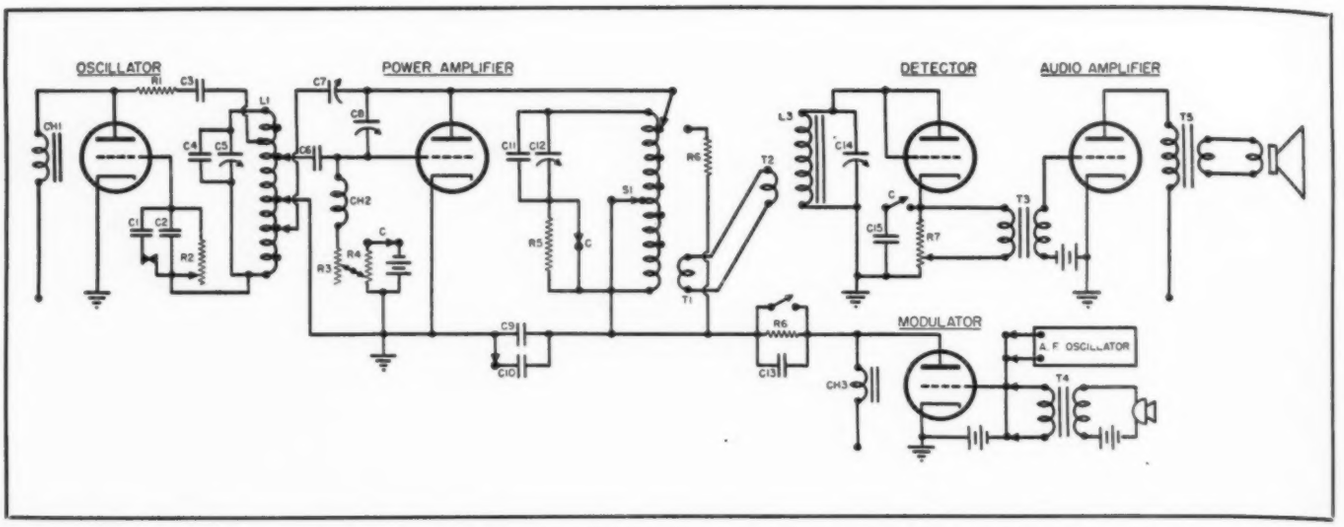


Fig. 6. Transmitter circuit consisting of a Hartley shunt-fed oscillator, power amplifier, detector, and Heising class "A" modulator.

The 60 c.p.s. sine-wave voltage developed across R2 will appear on the screen. Next, S2 is thrown to its upper position, placing the 'scope across R3, a portion of the load resistance and thus presenting on the screen a trace of the pulsating d.c. output of the circuit. This shows the student the effect of the rectifier action but there still remains the necessity for showing him just how this result is obtained.

To demonstrate the details of this function, the switch S-1 is thrown to the upper position of Fig. 2 and the hand crank which actuates the potentiometer is turned slowly. The frequency of the output is one cycle per revolution of this crank. The alternations of current at a rate of one per second or even slower permit the milliammeters to readily follow the current pulses through the diodes. A study of the alternate indications of the current meters and a comparison of these indications with those of the voltmeter clearly show the push-pull action of the two diodes.

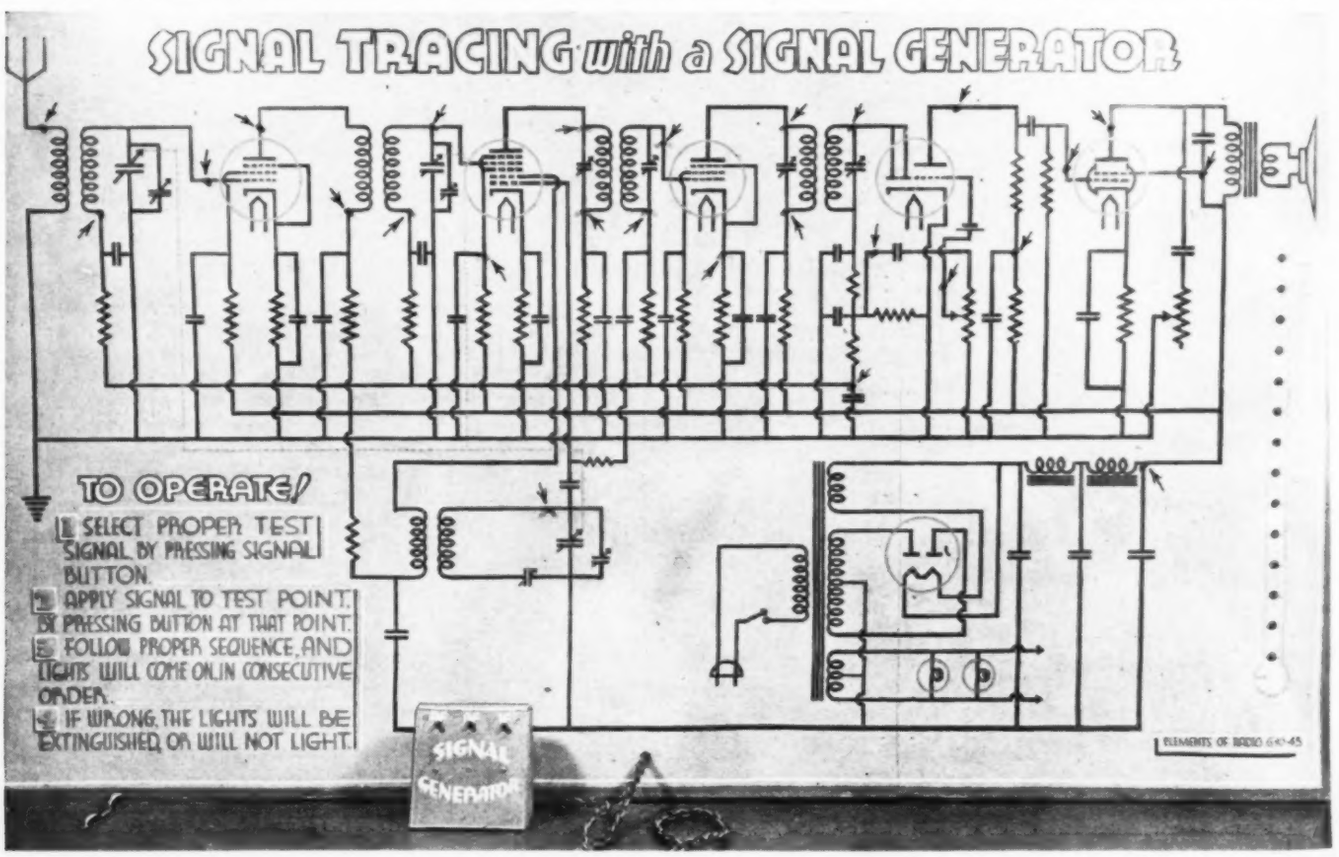
Constructional Details

As indicated in Fig. 2, the power transformer is simply a filament transformer in which the 6.3 volt portion of the secondary is utilized for the diode filament supply while the total voltage of all secondary windings (13.8 volts in the case of this particular transformer) is applied to the rectifier circuit. The center tap is obtained by means of the resistors R1 and R2.

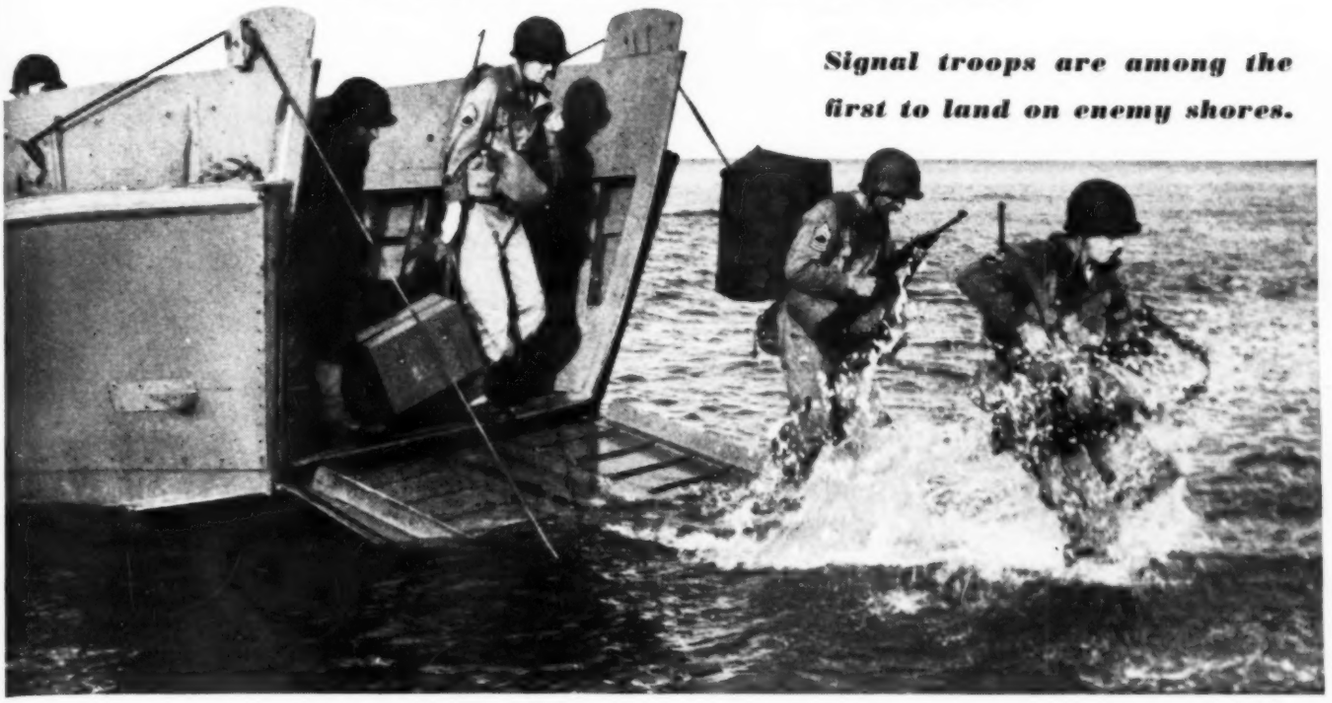
The only other component calling for explanation is the coupling arrangement which enables the crank shown in the lower left-hand corner of Fig. 1 to manipulate the

(*Continued on page* 412)

Fig. 7. Signal-tracing demonstrator. Arrows indicate strategically located push-buttons and thermometer scores successful tracings.



☆ ☆ AMPHIBIOUS ☆ ☆



Signal troops are among the first to land on enemy shores.

Going ashore with Signal Corps communication equipment during landing operations.

By 1st Lt. JOHN W. BRANDSTETTER



Born in Dexter, Iowa, 1914. Received degrees of B.S. & M.A. from Southwest Texas State College, 1934 and 1940. Did graduate work in speech and radio education, University of Texas, Columbia University, & University of Iowa. Taught radio and speech at Houston Texas High School and the University of Houston. Was Chairman of Houston Radio Education Committee. He entered Army, 1942. He graduated from Signal Corps Officer Candidate School in 1943 and was assigned to his present position as Asst. Chief, Office of Technical Information, Special Activity Branch.

CONDITIONS under which war is waged often change, and as our Army adapts itself to meet new situations, so does the Signal Corps quickly and flexibly move to provide necessary communication facilities.

The role of the Army and the Signal Corps in World War I was to exploit the art of trench warfare to the fullest, meeting the enemy inland on a long static front and advancing under cover of fierce artillery barrages only to dig in again when halted. Troops arriving from America were unloaded at ports far from the thunderous din of battle and then swiftly moved to the combat area with little danger from land mines, booby traps and bombing attacks.

But this is another war and the wide-spread positions attained by the blitzing Germans prior to America's entrance in the war, augmented by the advent of the Stuka, left no friendly docks at which American troops might be disembarked to press their attack against the Axis. Landings must be made by force and many casualties expected long before the first foot is planted on foreign soil. Axis coastal guns and dive bombers of the Luftwaffe speak hastily in deadly defense, and their effect is keenly felt far in advance of the time when the slowly moving and heavily laden Allied transports are ready to disgorge their cargoes of men and munitions into landing barges for the tense and bomb-attended ride to shore.

As the invasion crafts grind against the beach with Allied troops springing into the surf for the beach assault, the chattering fire of Axis machine guns blends noisily with exploding land mines, bursting bombs, and the sharp reports of enemy rifles.

This grim picture, vastly different from the wild flag waving attendant to our landings in France in World War I, has brought many revolutions in the training of Allied troops. Landings in Africa, Sicily, and Italy have found Signal Corps troops leading the way ashore to set up, well in advance, the communication facilities by which our leaders coordinated and directed the later movements of assault troops and their tons of supplies.

But these successful communication operations were not accidents. They represented long hours of study and planning of the countless difficulties to be encountered. They were the results of many more hours of painstaking and tedious rehearsals which were extended until every man knew his job and was prepared and determined to carry it out.

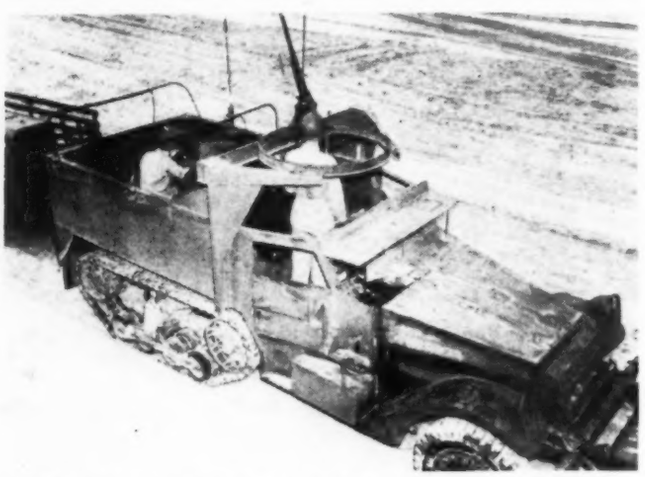
Amphibious operations are a complex enterprise and every detail must be exactly planned so as to afford the greatest chance of success. The problem of moving thousands of men onto a hostile shore and of supplying them with the necessary supplies and support calls for coordination of all movement. It is imperative that those in charge be able to make prompt and firm decisions in crucial moments that spell success or rout for the invading force.

It is at this point that Signal communications rise as a decisive factor in the successful accomplishment of any ship-to-shore movement. An ever-flowing stream of reports and observations must pour steadily into the commanders' pool of information so that all trends or all signs of enemy weakness can be quickly discerned and prompt advantage taken thereof.

But glamorous as it is, the amphibious operation is a deadly one. In those early morning hours when at "H"



Infantry advancing under simulated fire while Naval beach master and signalman direct traffic during amphibious operations.



SCR-299 transmitter mounted on half trac, used in Air Liaison Communications. Machine gun used for anti-aircraft protection.

hour the first wave of assault troops hits the beach and fans quickly out to seek cover, every movement and every step holds the imminence of sudden death. In a typical operation the landing team reinforced by the shore party strikes hard at the assigned portion of the beach. The first waves are assault troops and their job is to move quickly across the sandy approach and into the cover of the woods beyond to prepare the way for those who follow. Close on their heels follow the first elements of the shore party, and these intrepid soldiers slog their way through the mine-bedded sand carrying waterproofed field wire, radios, and telephones to start their task of setting up a complex nervous system that will permit the shore party commander greatest access to the swift occurring events of the battle. Hastily, but confidently, Signal troops seek out the most strategically located positions for switchboards and radio sets and in an amazingly short time radio nets are humming the signals vitally important to the success of the Allied landing while steel helmeted Signal Corps troops are laying field wire, connecting field telephones, and setting their message centers in operation.

By the time the regimental commander comes ashore to consolidate the beach into a regimental unit, the shore party commander has already welded an efficient communication set-up, established local security for the beach party itself, and put in motion the machine that will establish the vitally important stores of supplies needed to keep the initial assault troops moving forward. Long lines of field wire will follow the infantry inland and lateral wire circuits are quickly laid to insure coordinated action and integrated movement.

With the advent of daylight, however, the job is far from finished. By this time reinforcements for the assault troops have landed and the forward drive is pushed with the utmost vigor. Countless Navy craft are busy unloading heavy guns, tanks, armored cars, and the ubiquitous jeeps as well as tons of ammunition, food, and good substantial American trucks by which supplies will be moved. Every man works fast and hard with a weather eye peeled for the always impending strafing planes and dive bombers.

With wire-laying jeeps dashing one way, heavy trucks moving supplies in another, reinforcements moving up, bulldozers grading down layers of sand, half-tracs moving into defense positions, and countless streams of vehicles pouring from ships, it is difficult to comprehend how control of every activity could be maintained, but again communications can provide the answer. Motor, boat, and foot messengers, chirping radio sets, and winding telephone field wire, all insure a constant medium of operation to the message center chief whose job is to get the message through.

These operations all bring problems that are not present in many land assaults. Close liaison with the Navy must

Anti-aircraft defenses under fire during simulated combat in amphibious training at Cove Point, Md.





Signal Corps radioman being trained, during a simulated attack, to "get the message through" regardless of the noise and fury of battle.



Beach radioman "hits dirt" under fire during simulated operations, while undergoing strenuous amphibious training at Cove Point.



Signal Corps equipment being moved ashore. Troops well trained in amphibious operations made victory possible on Gilbert Islands.

be maintained both in planning and executing the Signal project. There must be no overlapping of frequencies to interfere with the activities of ships offshore or of the installations on land. Call signs must be mutually understood and procedure unified. Air liaison is essential in order to maintain the closest possible contact with friendly air power and to bring the weight of friendly bombs down in wrath on stubborn enemy positions.

It is obvious that the close harmony necessary to establish a smooth functioning communication network could not be the result of any haphazard planning or organization

(*Continued on page* 374)

Shore party commander using waterproofed handie-talkie during recent amphibious training maneuvers at Camp Bradford, Virginia.



"Dig your switchboard in early" is the cardinal principle in all amphibious training. Communications are vital in any offensive.



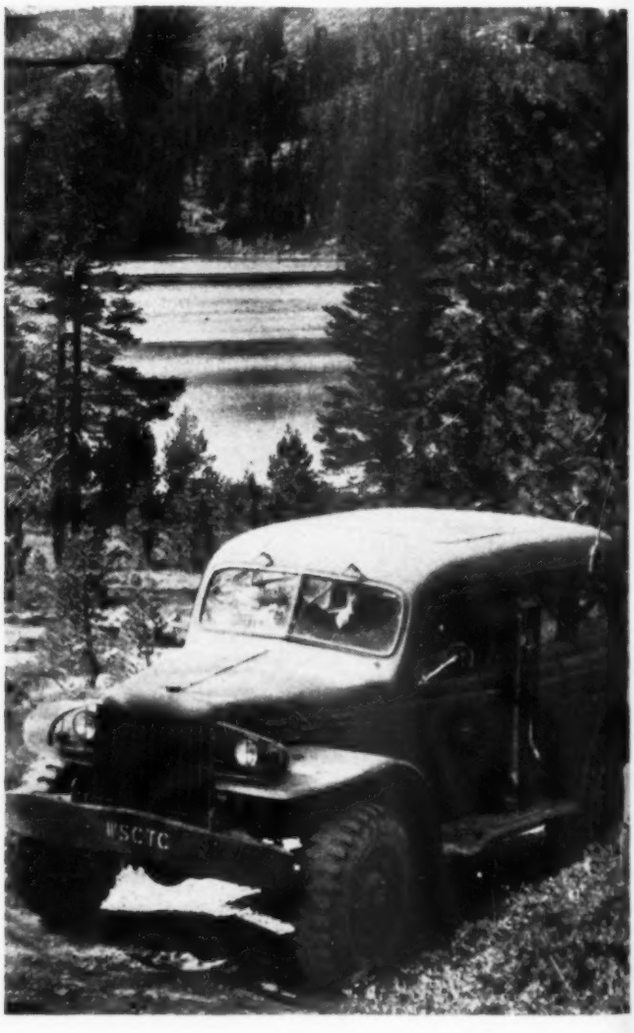


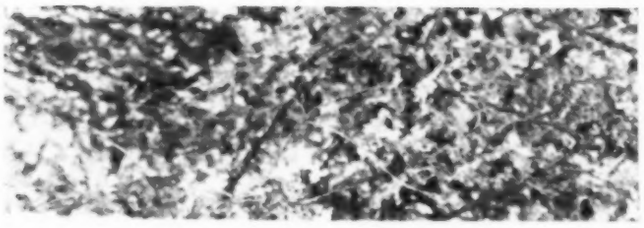
Western Signal Corps Training Center troops on maneuvers, operating from a well-camouflaged message center.

Troops are on "K" rations during maneuvers and only occasionally receive hot meals prepared in well equipped field kitchens.



On maneuvers in the Tahoe National Forest. Signal Corps radio-car maintains communications with other widely-spread military units.





Maneuvers

THE physical capacity and technical skill of our soldiers are proven during maneuvers which are scheduled after weeks of basic training. Under conditions simulating actual warfare —surrounded by the noise and vibrations of constant gunfire—men learn familiarity with recently acquired implements of war. The photos shown on these pages are typical of maneuvers held in a scenic forest location. Others are held under less ideal conditions—on deserts where difficult camouflages must be attained to protect the equipment, both from the blazing sun and the watchful eye of the enemy. And, in the arctic climate men must battle the freezing cold of snow-clad mountain terrain. Regardless of the misery of burning sand, waist-deep snow, or sweating jungles, our men must "get the message through" under every conceivable condition.



Camouflaged switchboard used as clearing point for wire messages to commands and units participating in maneuvers.

Radio-equipped military vehicles crossing rocky stream in Sierras. Men are tested for their durability and skill.



WIRE to TOKYO

The saga of the construction of the Alaskan Highway telephone circuit—a miracle of communications skill.

By Lt. Col. A. E. WHARTON



Born in Philadelphia, Pennsylvania, June 29, 1898. He attended Penn State College where he received the degree of Bachelor of Science in Mechanical Engineering, 1924. Was the division Plant Engineer with the New Jersey Bell Telephone Company until he was called to active service in the U. S. Army in 1942. He has been assigned to the Plant Engineering Agency, the Office of the Chief Signal Officer. He was assigned to his present position in January, 1943. He is now Officer in Charge, Communications Facilities Engineering Section of Communications Engineering Branch.

THEY wallowed through snowdrifts in swirling blizzards to string wire with 72-degrees-below-zero winds biting into their faces . . .

They dynamited post-holes in ground frozen solid to depths of six and eight feet . . .

They sloshed through Arctic muskeg mud and they battled spring floods and washouts . . .

They worked through stifling summer dustclouds and fought off mosquitoes and horseflies . . .

They drove through 2,060 miles of the roughest wilderness in North America . . .

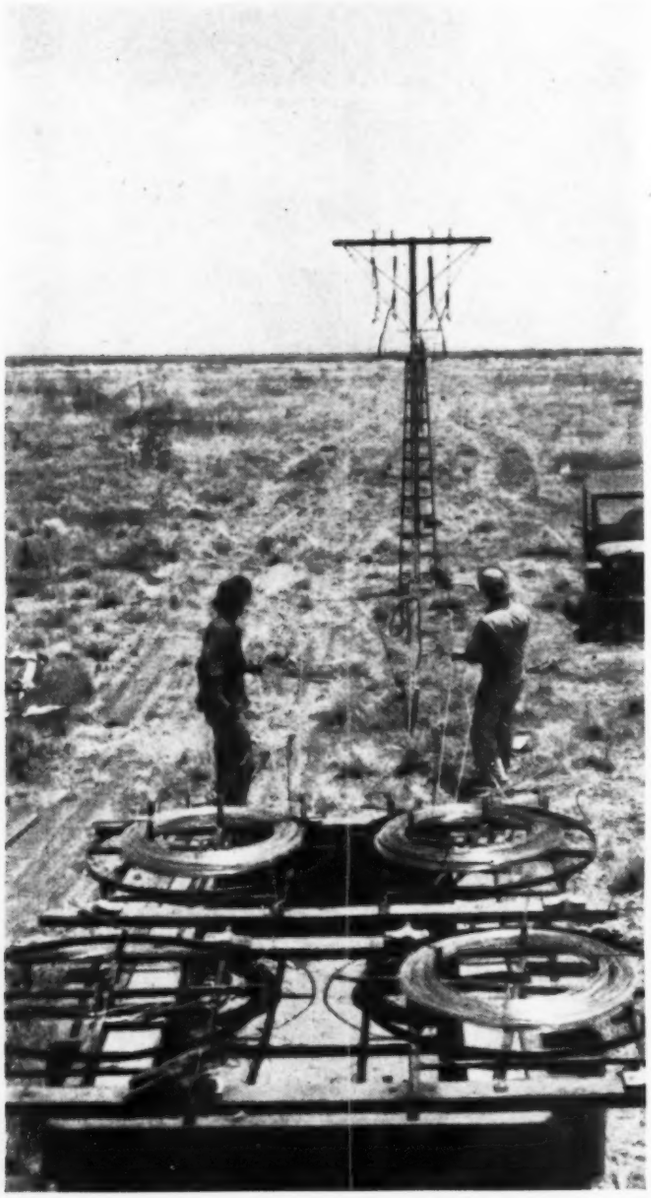
And they accomplished one of the modern miracles of communications engineering and construction—these men of the Signal Corps Army Communication Service.

Peacetime engineers had estimated — conservatively, they thought — that it would require a decade to link the United States and Alaska with telephone and telegraph service along the Alaska Military Highway route.

The Army Communications Service, working under the whiplash of war, did the job in slightly more than a year.

Behind this story of stringing wire along the road to Tokyo are the toil and sweat, the mechanical skill and ingenuity, the engineering and executive brilliance of thousands of men in many co-operating groups—some of them commercial firms—working together under the supervision of the Army Communications Service with a single purpose: To defeat time and nature in constructing the second longest carrier communications system in the world.

It became militarily imperative in 1942, if the Japanese were to be thrown out of the Aleutians and a concerted campaign expedited against Tokyo through Alaska, that the United States be connected directly with its huge territory near the Arctic circle. A highway and landline communications were needed, not only to carry out these operations effectively, but also to figure in postwar development of Alaska and the Yukon Territory with their tremendous potential oil fields, mineral deposits, virgin tim-



Men releasing cable from wire barrel during pole-line construction. Each reel is numbered for a particular position on pole.

Wire-laying team stringing open lines. Men are snubbing wire to end a section. Sag and tie-in crew will follow to lay new section.





Maintaining contact with first wave as it lands on Attu.



Signal Corps soldiers stacking telephone pole crossarms.

ber, fertile farmlands, and many other natural resources.

To the Army Communications Service, went the task of building a 2,060-mile telephone line with two circuits expanded by "C" type carrier systems to provide seven talking channels and fourteen teletypewriter channels along the Alaska Military Highway to be constructed by the Corps of Engineers.

The new communications system was to open to the outside world a region that had just a single telegraph line running along the railroad right-of-way only as far as Dawson Creek.

Communications, however, had to be maintained even before the land line was completed. Engineers constructing the highway needed fast and dependable methods of contact if the work was to progress on schedule. The Alaska Communications System, a component of the Army Communications Service in operation since 1915, immediately stepped into the picture with radio equipment and personnel.

A Signal Corps lieutenant was assigned to the Corps of Engineers staff as Communications Officer, and a radio team was attached to each Engineer regimental headquarters and to each construction party.

Working principally with walkie-talkies and SCR-193 sets mounted in jeeps, these teams maintained contact between construction parties constantly on the move in the trackless wilderness.

It was, however, a stop-gap arrangement. The Alaska Communications System long before had discovered that radio transmission over long distances was unreliable over the highway route; first, because of interference by the

(*Continued on page* 264)

Operating a field-telephone switchboard, set up in a dugout near front lines in New Guinea.



Crystals For S. C. SETS

The heart of American radio equipment is the tiny wafer that holds transmitter and receiver "on frequency".



Signal Corps technician using diamond saw to cut raw quartz crystals. Wafer-like sheets are produced and used as oscillators in many types of radio equipment.

TINY wafers of quartz crystal, vibrating like super-speed tuning forks, are at the heart of much of the modern radio communications equipment of the Army. Entirely unrelated in nature and purpose to the "cat's whisker" crystal detectors of the early home-built radio receivers, these processed quartz crystals are used to put a transmitter or receiver on its proper frequency.

Not many years ago a laboratory curiosity and more recently a comparatively costly item of broadcast and amateur transmitters, such crystals have now become a commonplace component of battlefield communications equipment. Their mass production, in a quality suitable for rugged military service under all conditions of climate, is a story of research and development carried on through the close collaboration of the Army Signal Corps and the American electrical industry.

When the front-line scout tightens his fingers on the "press-to-talk" button of the Signal Corps handie-talkie, he can report the position of an enemy machine gun over a radio channel that has been accurately established by means of a quartz crystal.

When the Cavalry or Infantry communications man slips another tuning unit into the staff-mounted transmitter and receiver of his guidon radio set—a set which may be carried on a horse, a jeep or erected on the ground—he is introducing new transmitting and receiving tank circuits built around a pair of carefully calibrated crystals.

When the Armored Command radio operator, buttoned into his heavy tank and rolling blind on caterpillar treads over the remains of enemy foxholes, pushes a button on the Channel Selector of his frequency-modulated radio, he

(*Continued on page* 358)

Placing crystals in drill press type lapping machine for grinding. Crystal wafers are ground uniformly to proper frequency.



Hand-finishing crystals to frequency. Electronic gauge permits crystal measurement to 1-millionth of an inch by beat frequency method.



AXIS QUARTZ CRYSTALS

The Germans use a crystal resonator to calibrate all pack sets. They are not used for frequency control.

By Capt. EDGAR A. WHITEHEAD



Born in Woodland, California, November 20, 1905. He attended the University of California and received a B.S. degree in Electrical Engineering in 1928. He is also a graduate of the Signal School in 1942. Since the time of his graduation from the University, he has been with the General Electric Company as an Electronics Specialist. He was called into active duty the middle of 1942 and was assigned to his present position early in 1943. He is now serving the U.S. Army in the capacity of the Officer in Charge, Enemy Equipment Identification Section, Intelligence Branch.



Acme Photo

Hastily erected field radio unit set up in Copenhagen during the Nazi "protective occupation" of the Danish capital.



Acme Photo

German portable radio detail established in a destroyed Soviet position, maintains contact between Battalion and Regiment.

ALTHOUGH there is no confirmation of Hitler's use of crystals for divination purposes, Axis military forces do use this silicon dioxide compound for the same reason we do—to keep radio sets on channel.

The Germans apparently realized and anticipated that quartz crystals would become a scarce item, when they started their design of military radio sets in 1934. They do not have any ready source of good crystals but, just as the rest of the world does, they have to depend upon quartz crystals from Brazil. Of course, some supply does come from the Russian territories conquered by Germany but this supply seems due to be cut off as the Red Armies continue to recapture occupied territory.

The German is very thorough and painstaking in his design and he therefore evolved a theory that he would use the quartz to calibrate his pack sets, used in the various units of the German Army, and not to actually control the frequency. He had another motive in doing so; namely, that this calibration could be done by communications personnel less skilled than the regular signal personnel. In other words to calibrate a German pack set, it is not necessary to have a skilled technician and an expensive frequency meter to check the frequency of the set.

The so-called German crystal resonator unit is very similar to our ordinary receiving tube in size and arrangements are made to plug it into any of the pack transmitters of the German Army. Each crystal has a certain basic resonant frequency, corresponding to the tactical use of the set in question, thus when a German operator turns a set on, he peeks through a peep-hole and adjusts his tuning until the crystal resonator glows brightest. He then knows the set is "on frequency" and sets the click stop or mechanical brake accordingly and so calibrates the set. These small crystals are rectangular splinters about twice the diameter of a head of a pin, which shows the careful use made by the Germans of this critical material. Approximately half an atmosphere of neon is in the tube, which causes a pink glow.

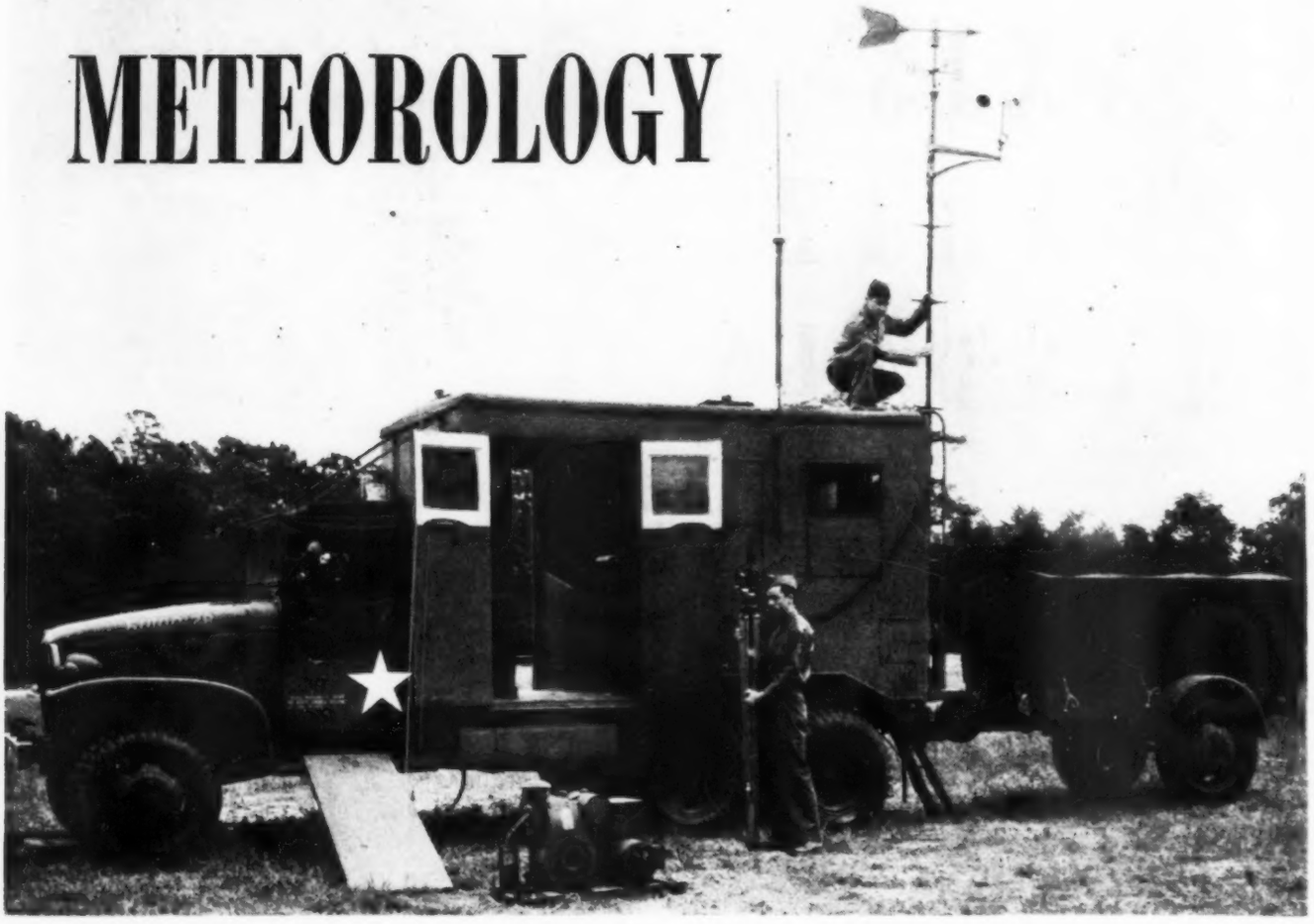
The Germans employ crystals in only a few sets which have special tactical problems or where an exact frequency is absolutely necessary. For example, in the German Notsender, or portable sea-rescue set, they employ crystal control so that the flyer forced down at sea will be able to be picked up quickly because the frequency is on the nose right at 500 Kilocycles per second.

The basic Luftwaffe ground-air liaison sets—both high power and for fighter and interceptor control from units located in the rear—use crystals also to control the frequency because of the great number of planes in the air, interference from our own sets, and ignition interference from the planes themselves. Other causes, such as static due to electrical storms, make it absolutely necessary that the Germans use crystals in this application.

The Japanese, on the other hand, use quartz crystals to control the frequency. These crystals are obtained from many of the same sources which we use and it was generally rumored—with some authenticity—that on the day

(*Continued on page* 443)

METEOROLOGY



Mobile weather station complete with all instruments necessary to obtain basic data for speedy and accurate weather forecasts.

Military strategists rely on accurate weather information to guide them in planning offensive operations. The meteorologists keep them informed.

By Major CARROLL W. ARFORD



Born in Marshall, Illinois, in 1905. Has the degrees of Bachelor of Science from the University of Illinois, 1931, and Master of Science from the Washington University, 1938. Headed the Science Department of the Madison, Illinois, High School from 1931 to 1937 when he joined United States Weather Bureau. Graduated from the Armored Force School in 1941. Served with the Armored Force at Fort Knox, Kentucky, and was called to active duty, 1941. Late that year he was assigned to his present position, which is: Officer in Charge, Weather Section, Aircraft Radio Branch.

THE Signal Corps has, or at least considers it has, a proprietary interest in the Weather Service of the United States Army. Regulations charge the Signal Corps with the "development, procurement, storage, issue, and major maintenance of the meteorological equipment used by the United States Army." But this is not a true indication of our interest in meteorology. A short review of the history of the meteorological service in the United States will indicate the reasons for this special interest.

It was long known by scientists that if weather observations could be made simultaneously at regular intervals at numerous widely-separated points and this data quickly transmitted to a central point, it would then be possible to estimate the future movement of storms thus forecasting coming weather. Shortly after the Civil War the Signal Corps, probably because it had ready access to telegraph facilities, became the agency in the United States which first made and transmitted regular weather observations for the purpose of forecasting. After about 20 years, Congress established the Weather Bureau in the Department of Agriculture and directed that equipment, records, and certain key personnel, be transferred from the Signal Corps to the Weather Bureau. After this transfer, the Army showed little interest in forecasting weather until the First World War, at which time the Signal Corps was again called upon to establish a weather service, keeping this service operating until quite recently when the operation of the weather service was transferred to the Army Air Forces.

Weather is not something new or occult—rather it is the result of physical processes in the envelope of gas surrounding the earth. Several of the simple basic facts of weather are as follows:

1. Warm gas (air) will tend to rise and cold gas (air) will tend to subside.
2. When a gas expands, it cools and as it is compressed, it becomes warmer.
3. As air becomes warmer it will hold more water vapor,

and when cooled sufficiently, the water vapor will be dropped out as precipitation.

4. As air moves over the surface of our globe it passes over water and absorbs moisture; is warmed or cooled by conduction from ground surfaces and solar radiation, and elevated by passage over mountains.

Consideration of solar heating and air movements would suggest that the air at the equator would be heated and rise. The air near the surface would then move toward the equator from polar regions. This movement of air actually occurs but is varied by the earth's rotation, local orographic conditions, and warm or cold areas. In general storms move from west to east with a velocity dependent upon their intensity, the latitude, time of year, and the characteristics of the terrain over which they pass. Storms, the direction of their paths, their intensity, and duration are of vast military importance since the attendant clouds will hide planes, ships, and installations from visual observation, thus affecting the conduct and outcome of battles.

Numerous examples of the effects of weather on the course of battles are known to the students of wars. Among the more interesting ones that have occurred in this war are the following:

Flight of the German fleet through the English Channel. The Germans had part of their fleet in the French harbor of Brest and some units in German ports. While divided it had little chance to challenge the British fleet, and due to the rising power of the Royal Air Force the ships in Brest were liable to considerable damage from bombing attacks. In order that these ships might join the balance of the fleet, it was necessary for them to either steam northward around the British Isles or race through the English Channel (only 20 miles wide at the narrowest point). The latter plan was chosen. German meteorologists picked a day when there was a low cloud cover and very poor visibility over Brest and the channel. On February 12, 1942, the Gneisenau, Scharnhorst, and Prinz Eugen with escorting destroyers and mine sweepers slipped out of their harbor and were well on their way through the narrow waters before the British reconnaissance planes even discovered their absence from their harbor. An umbrella of German fighters protected the ships from successful aerial attack and the poor visibility prevented the British coastal guns from firing effectively. The German fleet was united with relatively little damage.

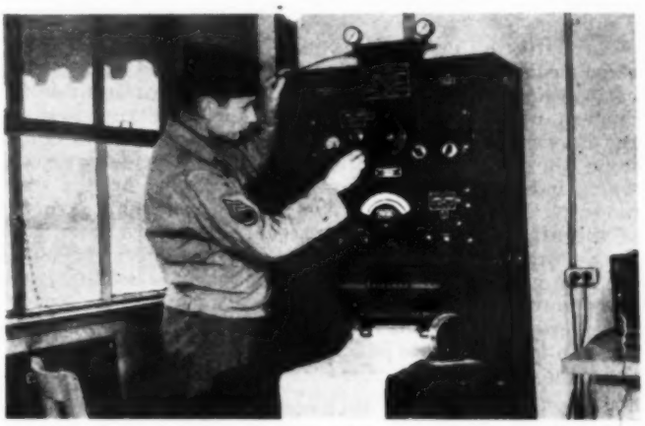
Battle of the Bismarck Sea. The Japanese considered it necessary to reinforce their garrisons in the southeastern part of New Guinea, they assembled a convoy totaling 22 ships with about 1,000 troops aboard, and sent it into the Bismarck Sea. Since the American and Australian flyers effectively had control of the air in this area the Japanese moved their convoy southward under cover of a tropical storm which normally would have provided protection all the way to Lae and Salamaua. Reconnaissance planes sighted the convoy and then lost it due to the thick weather, but on March 3, 1943, the storm deserted the Japanese and moved eastward leaving the fleet with no protective cloud cover. The Allied airmen had the chance they were looking for, losing only four planes in destroying the entire Japanese convoy.

Sicilian Invasion. General Eisenhower wanted several days of good weather on the African shore to prepare his invasion fleet, and then needed reasonably rough water for his initial landing in Sicily in order that the landing boats would not make good targets for shore fire. Off shore winds from the Sahara in Africa gave him the good weather needed for the preparation and a cold front moving southward across Sicily provided the rough sea desired for the initial landing during the early morning hours. Late in the day, after beachheads were established, the sea became calmer and reinforcements were easily landed. The invasion did not just "happen" to occur at the time when weather conditions were favorable: rather the meteorologists of the Army Air Forces picked the time when the desired combination of events would occur.

Prior to the outbreak of the present war, the Army and Navy had relatively few weather reporting stations. The United States Weather Bureau operated approximately 600 stations in the United States and Alaska all of which



Clinometer—to be used in conjunction with ceiling light projector. Instrument assists in determining elevation of clouds.



Trained operator tuning in on radiosonde equipment for latest data on pressure, temperature, and humidity of the upper air.

Generator, developed by the Signal Corps, is used to produce hydrogen gas for meteorological balloons, prior to their ascension.



made surface observations of the barometric pressure, relative humidity, wind direction and velocity, cloud cover and types, precipitation, maximum and minimum temperature and rainfall. Over 100 also made pilot balloon observations to determine the direction and velocity of the upper winds, and about 40 made radiosonde observations. As the Army of the United States started to expand, the Army Air Forces perceived the need for a world wide network of weather stations with trained forecasters. Forecasters and weather observers were quickly trained in universities and service schools. The Signal Corps procured the equipment required for this service—no easy task as manufacturers were required to rapidly expand their pre-war facilities by 10 to 20 times to produce the amounts of equipment necessary for this expansion. One of the most fruitful of the development projects carried out by the Eatontown Signal Laboratory was the installation of a complete meteorological station in a truck for mobile use. Considerable modification of delicate equipment was necessary in order that it would not be damaged in moving. These sets have been used in active war theaters and have proved to be quite valuable under such conditions.

Basically the instruments used for weather observation were designed and used prior to this war and only modifications have been made to obtain equipment suitable for modern warfare. These meteorological instruments are the maximum and minimum thermometer used to determine the daily temperature extremes, the psycrometer which indicates the moisture content of the air, the thermograph and barograph which provide continuous records of the air temperature and pressure, the barometer used for accurate determinations of the atmospheric pressure, the rain gage, the pilot balloon theodolite, is used to track a meteorological balloon rising freely into the upper atmosphere at a constant rate, and to determine the balloon's position in space from which data the direction and velocity of the upper winds can be determined. Those who saw the Signal Corps picture "Report from the Aleutians" probably remember that a weather observer made a pilot balloon observation just prior to the take off of the American planes on their bombing flight over Kiska.

The radiosonde is the most intriguing of all meteorological instruments. It consists of a tiny radio transmitter, battery, pressure, temperature, and humidity elements with a total weight of about three pounds. This instrument is sent aloft on a neoprene balloon filled with hydrogen gas, and as it rises through the atmosphere to altitudes up to 60,000 feet, broadcasts the meteorological conditions of the atmosphere to a receiving station where the signals are recorded graphically on a moving strip chart. Trained observers decipher the record and prepare it for distribution to the forecasters.

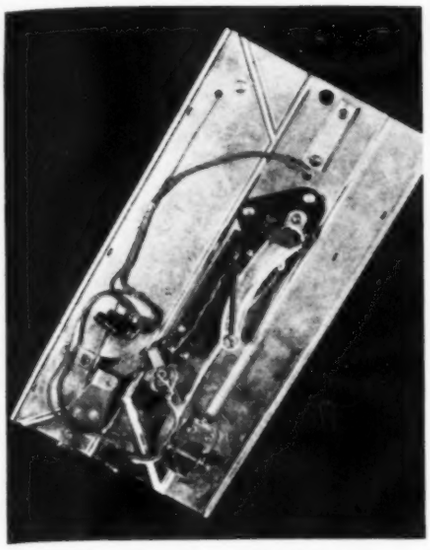
The forecaster has a wealth of information upon which to base his weather predictions. Weather records for the entire world have been collected in a weather atlas to show the forecaster the types of weather which are to be expected in any area. A weather map with surface data from many stations is prepared showing the current pressure systems and present weather over large areas. The pilot balloon and radiosonde charts present a picture of the air above the surface of the earth. These maps and charts are augmented by pilots' reports of atmospheric conditions encountered in flight.

Three years ago United States meteorologists were able to prepare adequate short term forecasts (up to 48 hours) and also prepared five day forecasts. The results of these five day forecasts were promising, but with the entry of the United States into the War, weather became a military secret and no more long range forecasts were given out to the public. Under the impetus of the war, however, long range forecasting has taken great strides and at present the long range predictions are more accurate than even the most optimistic meteorologist would have believed possible two or three years ago. New forecasting systems

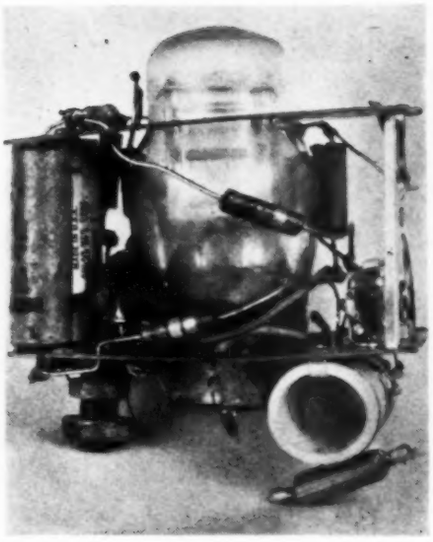
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Theodolite instrument used to observe atmospheric conditions, velocity, density and wind currents of the upper stratosphere.

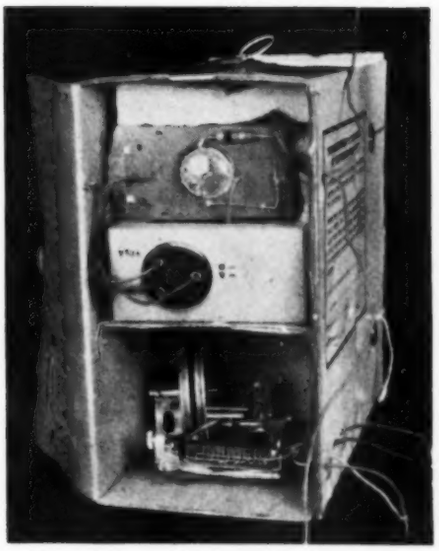




Humidity unit of the ML-141-B assembly showing the humidity resistor.



Radiosonde ML-141-B transmitter subassembly. Note compactness of parts.



Complete assembly with battery. Barograph is located in lower compartment.

RADIOSONDE

Packed in a plastic-covered case about the size of a shoe box—the radiosonde transmits weather information from the intensely cold stratosphere.

"HAMBURG Wiped Out."
"Flying Fortresses Raid Rabaul—All Return Safely."
"Allies Invade Italy."

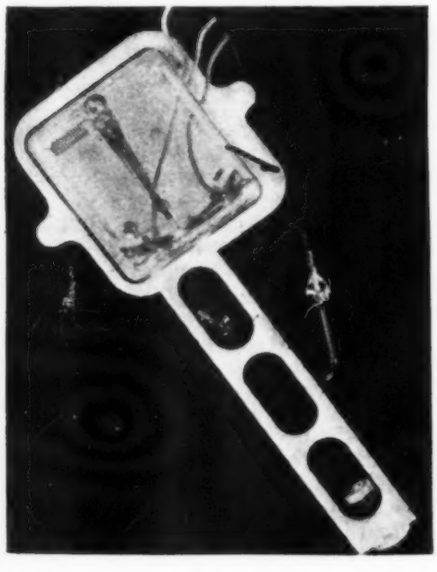
Behind such headlines heralding United Nations' successes is the story of a little-sung hero—a tiny but ingenious device called "radiosonde."

Some of America's beautiful blondes played an indirect role in those successes, too, for hair from their heads is an integral part of this super-sensitive weather recording invention.

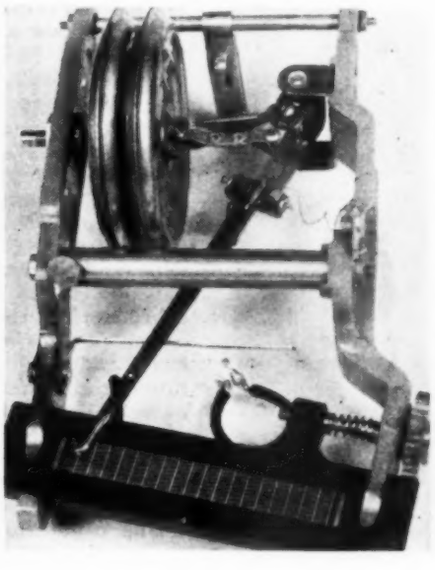
Radiosonde, consisting of remarkable meteorological instruments and a miniature radio transmitter, is sent aloft by balloon. As it travels upward, sometimes as high as ten miles, it broadcasts conditions of the atmosphere

(*Continued on page* 266)

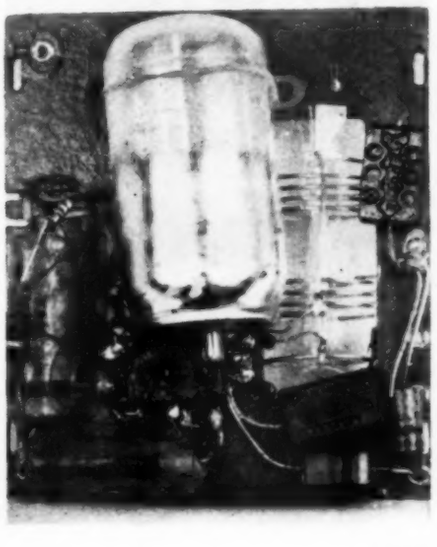
Humidity unit. Human hair is occasionally used to indicate variations in humidity.



Baroswitch, showing pressure element and commutator. Variations are sent via radio.



Transmitter assembly uses baseless tube. Wire leads are brought out for connections.





An officer of the Aircraft Laboratory testing the VHF radio equipment aboard a P-51 aircraft.

AVIATION RADIO

The SC Aircraft Signal Agency develops equipment for air communication and navigation purposes.



Assistant taking notes from mechanic on location of radio noise.

By Colonel HOBART R. YEAGER

Born in Ohio in 1895. Graduated from U. S. Military Academy in 1918 and Command & General Staff School, 1939; Coast Artillery School, 1920; Air Service Pilots School, 1921; A. S. Pursuit School, 1921; A. S. Technical School, 1925; and Air Corps Tactical School, 1938. Holds ratings of Command Pilot and Combat Observer in the Air Corps. Assigned to Aircraft Radio Laboratory in 1939, serving as Chief of Air Navigation Unit and later of Communications and Navigation Unit. At present is Director of the Laboratory and C. O. of S. C. Aircraft Signal Agency.



IN A previous article for *Radio News* (November, 1942) the organization of the Signal Corps Aircraft Signal Service was discussed. This service recently underwent an administrative reorganization and is now called the Signal Corps Aircraft Signal Agency.

This Agency is located at Wright Field, near Dayton, Ohio, and consists of the Aircraft Radio Laboratory and the Aircraft Radio Maintenance Division. The Agency is charged with research, development, preparation of procurement information, and maintenance planning required in the radio field incidental to design, supply, and installation of radio equipment on aircraft for communication and navigation purposes. In order to perform these functions properly, close cooperation is necessary with the Materiel Command at Wright Field, the Air Service Command at Patterson Field, the Dayton Signal Corps Procurement District and Depot, and the various research and manufacturing organizations in the radio field. Their job is to

provide the best and most reliable radio equipment for Army Air Forces airplanes.

Today we do things with radio which were considered in the realm of fantasy a few years ago. It is a radio war. The commander, who knows how to get the maximum use out of the available radio devices, has a tremendous advantage.

As this article is being written the skyways in many latitudes over the globe are filled with American planes and the lifeline that binds them together and provides them with guidance from the ground below is radio. Without radio, each plane in the air is a lone entity on the horizon, effective within the human limitations of the man or little group of men that control it. With radio, the same airplane becomes a part of a flying combat team whose combined operation has the effect of many entities welded together, each contributing its own effectiveness to one purpose. Radio provides the bond that magnetizes a formation into one machine.

Valuable in group flying, radio, however, serves a primary purpose as a safeguard and aid to the individual. The vast stretches of the skyways can become a very lonesome place for the occupants of a lone plane on a long, weary mission. Nor can the value of radio be underestimated to the pilot who, after a life and death struggle in enemy skies, finds himself out of ammunition, low on gas, and miles from anywhere, with the uncomfortable but persistent thought that an enemy patrol might chance upon him and blast him from the heavens; or picture for a moment that same plane forced down through lack of fuel. At the last desperate moment a hidden field looms up. Friend or foe? A familiar challenge comes through the earphones—and all is well.

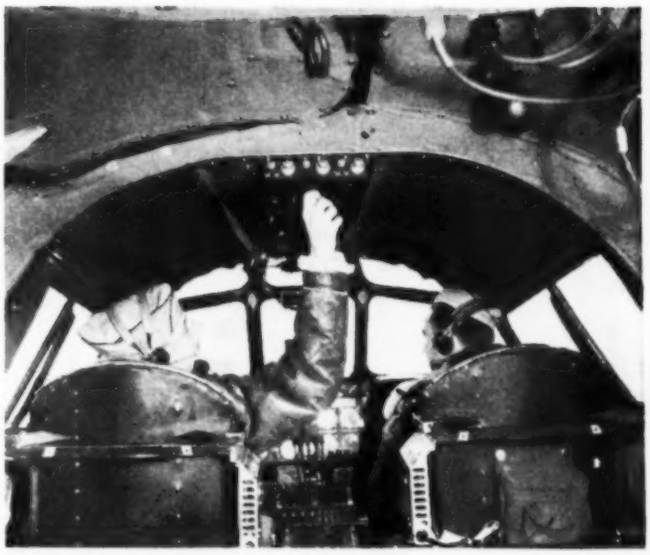
In order to get the maximum use from our aircraft radio, it is necessary that adequate supply and maintenance facilities be made available, and that operating personnel be familiar with the capabilities and limitations of the equipment and know how to employ it to the greatest advantage on military flights. Every day thousands of Army Air Forces airplanes fly all over the world in all kinds of weather. Many of these flights could not be carried out successfully except for radio and radio plays an important part on all flights.

The installation of airborne radio in Army Air Forces airplanes involves many problems. Every effort is made to get the best antenna installation and the best location to facilitate ease and efficiency of operation. However, the location of the component parts of the set must be coordinated with the other equipment which is carried, such as, armament, aerial cameras, oxygen tanks, and so forth. Frequently the installation is a compromise in order that all of the various types of equipment will have a location which permits of their satisfactory operation. Since Army Air Force bombers have power-driven gun turrets and bomb-bay doors, the number of possible locations for radio antennas is limited as compared to commercial transports.

During the past year a particular effort has been made to make available instruction books and test equipment at the time new equipments go into production. It is absolutely essential that maintenance personnel have available an instruction book at the time they receive new equipment. Also, the test equipment should be at hand. The instruction book and the test equipment cannot be finished until the basic design has been frozen. Therefore, there has been a tendency for the supply of these items to lag behind the basic equipment. However, we have found that the manufacturer can get these items out on time, provided proper planning and engineering have been carried out.

One of the most serious problems in the operation of airborne radio is radio noise. This noise may be of the so-called "man-made" type, coming from the high tension ignition system of the aircraft engine and the various interference generators on the airplane, such as, aircraft generators, electric automatic pilots, electric propellers, and so forth, or it may be atmospheric noise due to thunderstorm static or precipitation static. The latter type of interference can be greatly reduced by going to frequencies

(*Continued on page* 260)



Pilot adjusting the frequency of his command radio equipment.



Enlisted man takes notes on message coming in on liaison set.



Map showing the symbolic plotting of terrain of model landscape.



FM multi-channel transmitter and receiver used by Field Artillery.

Vehicular Radio

By

Col. HERBERT G. MESSER



Born in Texas, 1895; attended Alaska University, 1924-26 and completed graduate course in Comm. Engineering, Yale University, 1930. Graduated Signal School, 1922 and Air Corps Tactical School, 1938. War Radio Officer, Washington-Alaska Military Cable and Telegraph System, 1924-26; Officer in Charge, Radio Navigation Unit, Aircraft Radio Lab., 1930-36; Radio Repair Section, Panama Air Depot, 1938-40; and was communications advisor to the Brazilian Air Forces with U. S. Military Mission, 1941-42. At present is Chief, Signal Equipment Branch.

☆

Unified command—made possible by radio—has increased the firing power of American-made tanks.

☆

OUT where the bombs are gouging out the earth's surface and the big guns rumble their obligato to the rifles and machine guns, where the costume for men's exploits is chiefly grease, grime, and blood, the development of vehicular radio really begins.

Those charging tanks at the very forefront of modern battle are not only fire-belching forts as individual units but when maneuvering as a team are doubly formidable and unbeatable. The fire-power of American tanks has been multiplied many-fold by the unified command made possible by radio. Through radio the quarterback directs the play, assigns the decoy, sets up an ambush, and takes advantage as soon as possible of any hole that may appear in the enemy lines.

This communication was achieved by packing more power into a cubic inch of radio than had ever been dreamed possible, by assembly and disassembly far into the night . . . and, yes, even from men's curses on the battle field . . . "This damned thing never works right when it rains." . . . "That's a hell of a place to put that transmitter; I can never get at it!"

The complaints, the suggestions, and the requests come in, are sorted, studied, and out of them come the modifications of existing equipment and the design of new equipment to fit the needs of combat. Or it goes beyond the radio, to the vehicle itself; a hypothetical case will illustrate the process:

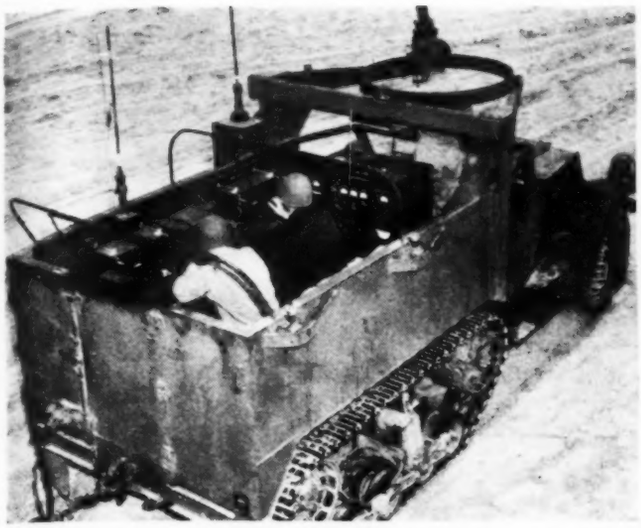
The tank crews return from the engagement, perhaps not all that started out.

"Jerry outranged us," they say. "We can't get close enough to that new baby he's got. Starts layin' shots around us before he's anywhere near the range of our guns."

Up from the battlefront goes the cry, "We need a longer range gun on that General ———— Tank. Those ricocheting shells sure knocked the hell out of our radio, and when Sarge in the command tank came on the air to tell us where Jerry was, we missed the message altogether."

Back in the United States, Ordnance engineers have been experimenting with a new tank construction, hundreds of pounds lighter, yet ballistically better than ever before. There's also an engine about ready for production that will increase speed by ten miles an hour. Take these features, combine them with a longer range gun, and a lot of other improvements that have been suggested by American ingenuity and by the experiences of combat, and design them into a new model.

Concurrently with the design of the new tank, communications requirements are considered. With its various innovations, this tank will operate further from its base, so it must have a radio of greater range. The tank commander will sit in a different place, so the radio set must be relocated. The noise of combat and the roar of more powerful engines dictate that an interphone system for



Interior view of SCR-299 on half-trac mount, used in Air Liaison Communications. This unit helped attain victory in Africa.



Ground portable radio set installed in jeep. Transmitter operated by telegraph key attached to the leg, or by voice telephone.

communications within the tank itself is an absolute necessity. "Military characteristics" for the tank's communications system are drawn up by the Armored Command. These are submitted to the Signal Corps, and come down through the Engineering and Technical Service to the Ground Signal Equipment Branch and then to the Signal Corps Ground Signal Agency.

One of the present model radios is found to come nearest to the specifications; there are certain requirements it doesn't meet, and there are several changes and modifications necessary. These problems are taken to the Laboratory. Many conferences follow among the Signal Corps engineers, the Ordnance engineers, and the tactical experts of the using arm to iron out inevitable discrepancies between what's wanted and what's possible. Presently, the engineers come forth with a model that meets all the specifications insofar as ingenuity will permit.

Meanwhile, the Ordnance people have built a wooden model of the new tank, constructed to scale, and they're busy learning what defects of the blueprint plans show up when they are projected to actual size. When they're through with it, the Signal Corps engineers install the model radio they've built to see how it's going to fit into a scale model of the tank. Next a soft steel model of the tank is constructed, at which time another phase vital to the success of communications is considered. Getting the basic communications equipment into a vehicle is only half, or less than half, of the job. The rest of the problem is making it operate. That is the problem of suppression.

The modern vehicle of war is a rolling powerhouse of electricity, every watt of which is bent on interfering with radio communication operation. The gun-firing mechanisms, the turrets, timing devices, special lights, sirens, all are electrically operated in addition to the commonplace electrically controlled functions of a vehicle. Filters, capacitors, suppressors, shielding, and bonds all play their part in suppression, but the greatest degree of suppression has been achieved in original design of the vehicle.

The engineers go to work on the problem. "Why couldn't all the interference be decentralized," they asked, "with each interfering circuit, filtered at the source and as far as possible from the radio." The wiring system is designed so that the greatest source of interference is eliminated, leaving isolated trouble spots that can be dealt with by special suppression techniques. They made a shield of the engine compartment itself to blanket down the engine's electrical mischief.

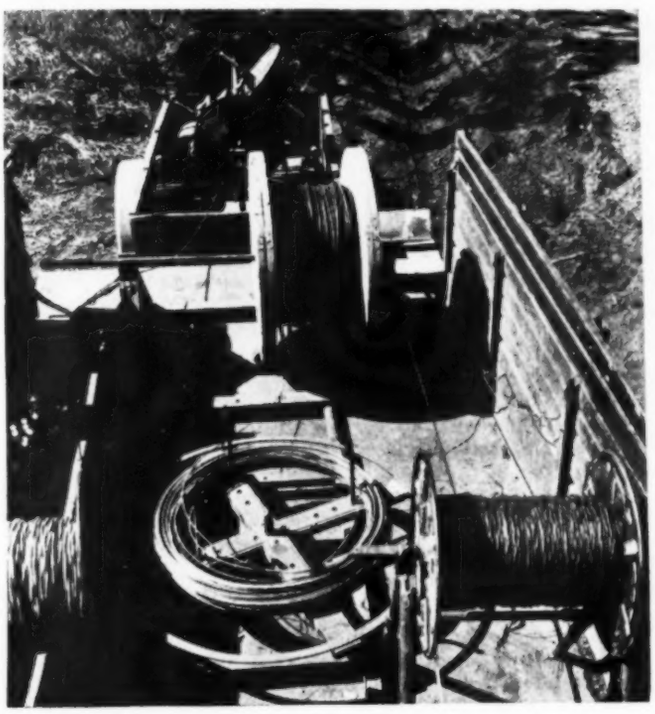
The steel model is then put through tests, with the new development radio set in it, and is subjected to all the test conditions that its construction will permit. Finally, complete with all the corrections born of the previous tests, one or more armor-plated tanks are built, piece by piece,

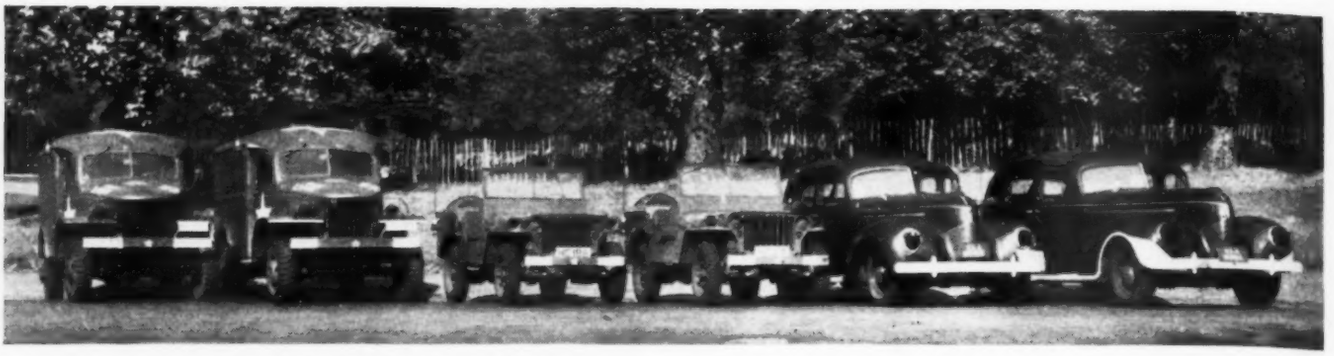
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Wire laying crew and a R-L-26 on a two-and-a-half ton truck. Many miles of wire can be laid by these men in a single day.

Cable-spinning trailer and tender truck. Cables from separate reels are automatically twisted together, and laid in a trench.





Group of military cars used for MP communications. Note the mounted antennas on each vehicle.

MP Radio in the ETO

American military personnel in Britain are under the watchful eye of the MP. They have a very elaborate communications system.

By Major DAVID TALLEY



Born in New York, 1903. Received B.S. degree in Electrical Engineering, Brooklyn Polytechnic Institute. He was Plant Department Engineer with the New York Telephone Company and operator of amateur radio station W2PF before being called to active duty in 1940. With the Research & Development Division, Office of the Chief Signal Officer, Army Amateur Radio System; then assigned to the Signal Section of the 5th Corps in Northern Ireland. He has been in his present position since 1940, which is the Officer in Charge, Engineering Branch, Signal Supply Division, E.T.O.

"CAR fourteen, return to headquarters" and similar radio calls can often be heard on the short-wave police bands in the United States. But when a certain U. S. Army colonel, walking along Piccadilly Circus, recently heard these words in an unmistakable Brooklyn accent coming from a radio set in a parked jeep, he had to look twice to make sure he was in London and not in New York.

The average American, young or old, likes to go to town on Saturday nights. The fact that he is in the Army and in a different country does not change this habit very much. It is not surprising, therefore, that the number of U. S. soldiers on the "High Streets" of some English cities compares favorably with the crowds found on the main streets of typical American towns. The resultant traffic imposes heavy burdens both on the civil and the military police.

The need of a radio patrol system to assist the military police in their duties of protecting American troops had been foreseen early by the Provost Marshal General of the European Theater of Operations. The supply of the necessary equipment and its installation was undertaken by the Chief Signal Officer, SOS, ETO.

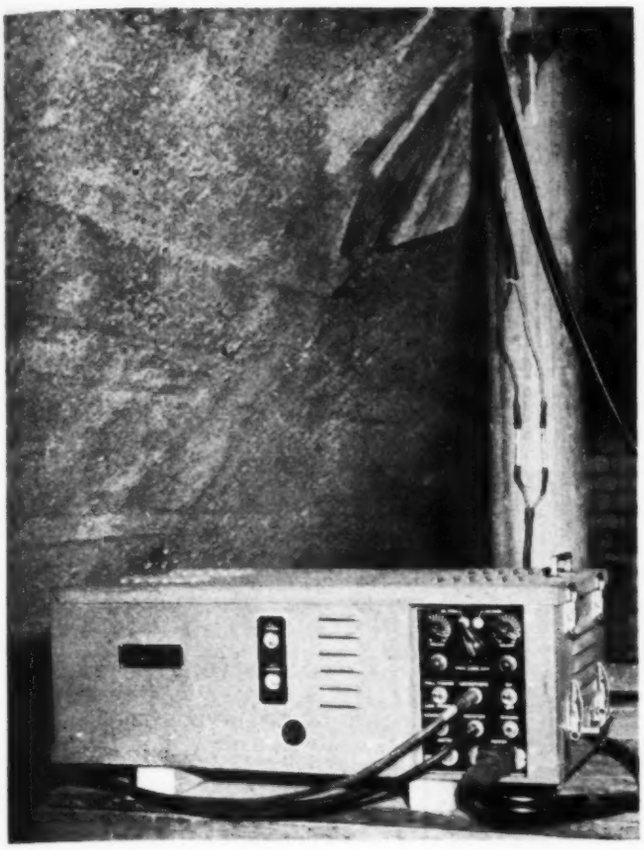
A number of radio sets of the frequency modulated type, very much like the commercial police radio equipment used in the U. S. was made available. These particular radio sets were ideal for the purpose except that the battry voltage required was greater than that normally available in the jeep and other vehicles which were to be converted into radio patrol cars. With the assistance of the Ordnance Service, this difficulty was soon surmounted. Higher voltage generators were fitted in the cars and, after a few minor changes in the vehicles' electrical sys-



Frequency modulation is used for all communications by the MP.

Transmitter mounted in rear compartment to reduce antenna losses.





Transmitter mounted at base of antenna is remotely operated.

tem, the required battery voltage was obtained. The high current taken by the radio set had to be considered in the modification of the electrical system in each car. It was necessary to make battery leads of short, heavy wires to minimize the voltage drop.

Vehicle Antennas

A correctly designed antenna, for the particular frequency to be employed, is very important for efficient operations on the very high frequencies. Preliminary experimental tests verified the fact that the rear bumper mounted type of antenna gave poor results. The metal body of the car absorbed considerable radio frequency energy. The antenna mast base, therefore, was mounted as high as possible on the car body.

In the case of the sedan type patrol cars, it was possible to support the rod aerial adjacent to the rear window. The "Black Maria" (formerly an ambulance) has its antenna mounted at the edge of the roof of the vehicle body. For the jeep, it was found satisfactory to install the mast base right next to the radio set. All of these arrangements were designed to afford short antenna leads in order to reduce to a minimum the losses in the lead-in cable.

The radio sets, in the sedan type of patrol cars, are mounted in the rear trunk compartment. The short antenna lead-in is a marked advantage of this location. It was necessary, however, to design a remote control panel to function with this set. Use was made, in this connection, of the glove compartment on the dashboard for these controls, which are all custom designed. In this way, the loudspeaker, microphone and switches are easily accessible both to the driver and the accompanying military policeman.

The installations in the other vehicles are made in the standard manner. The controls on these radio sets are handled by the MP in the vehicle.

The Control Station

The location of the central control station is most essential to the successful operation of any police radio

(*Continued on page* 254)



Control station showing receiver and transmitter control panel.

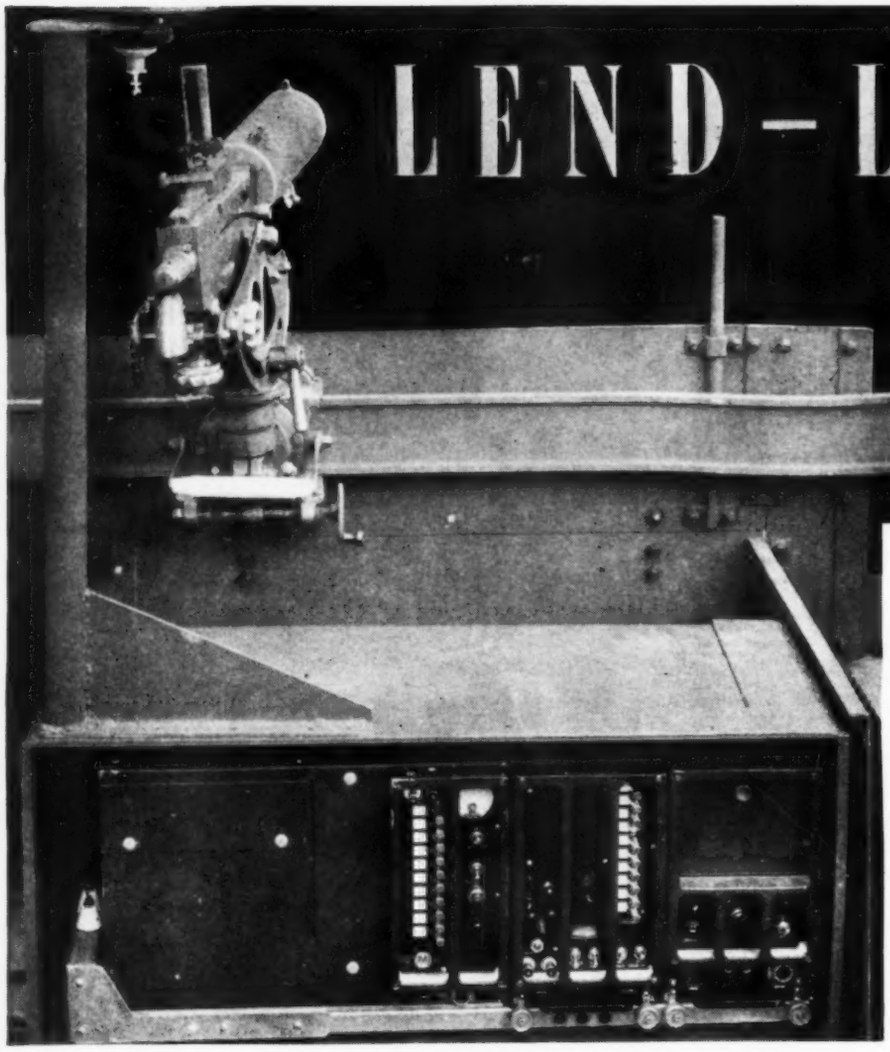


Control panel mounted on dashboard of a right-hand drive sedan.

Officers reviewing jeep-mounted Military Police communications unit.



LEND-LEASE



Panel layout of a development model radio set SCR-508 installed in a half-trac.

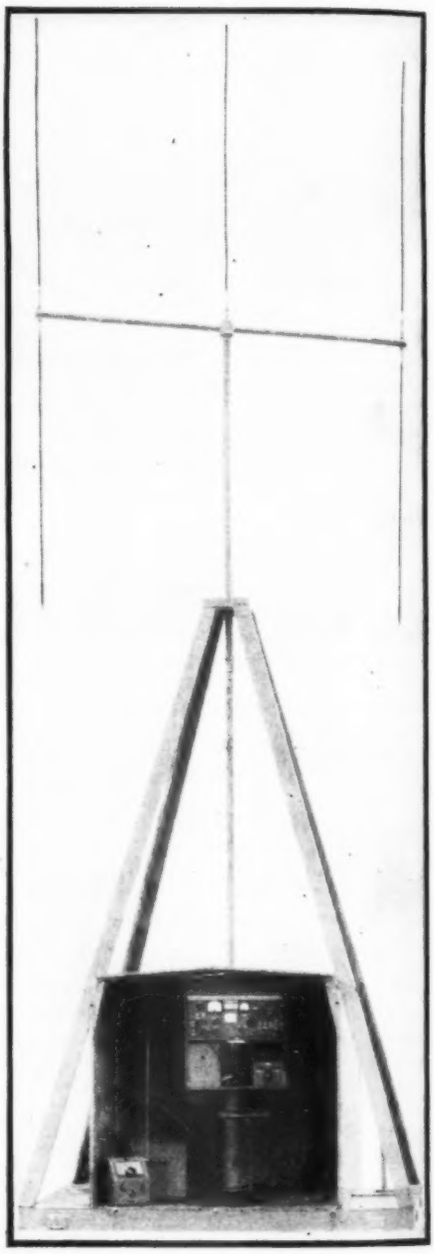
American-made supplies are rushed to Allied comrades in huge quantities the world over.

IN THIS global war—demanding communications that encircle the earth and requiring, at present, more than 56,000 miles of protected supply lines—the mastery of logistical problems may well mean the difference between victory and defeat.

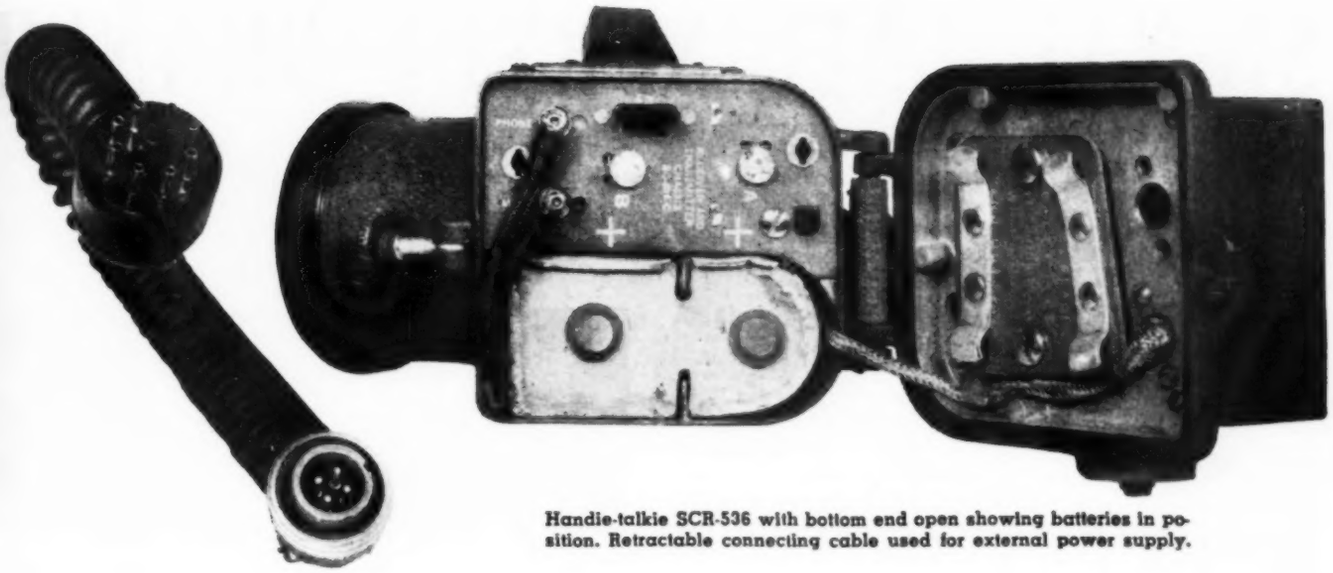
The Army has a simplified definition of logistics: "The right material in the right amount at the right place at the right time." That terse definition is admittedly correct as far as it goes but meeting its terms is one of the sternest and most formidable tasks ever imposed on military men.

These tasks, now being discharged primarily by the Army Service Forces, include the supply, equipment, and movement of troops at home and overseas; the coordination of production requirements for military munitions in the United States, the provision of a steady stream of supplies to various theaters of war, and myriads of other responsibilities requiring the utmost preparation and precision.

Along with the responsibility for supplying and trans-



Direction finder radio set SCR-555.



Handie-talkie SCR-536 with bottom end open showing batteries in position. Retractable connecting cable used for external power supply.

porting American troops goes the problem of providing munitions and supplies to the United Nations and, in most cases, transporting them overseas.

In his recent biennial report, General Marshall said:

"We are equipping the Chinese troops and French troops, we have been providing equipment for the British, the Australians, the New Zealanders, and the Canadians, we have furnished supplies to Latin American republics—we have been truly an Arsenal of Democracy.

"All this demands an elaborate system for allocation, distribution, and transportation, to be coordinated with our daily normal problem of meeting the demands of our own forces."

The Lend-Lease activities of the Army are an integral and important part of the elaborate system noted by General Marshall. These activities are under the supervision of Army Service Forces and the International Aid Branches of the various services. Their chief responsibilities are to process requirements and initiate procurements. They further direct the transfer of equipment to Allied nations pursuant to the decisions of the Combined Munitions Assignments Board.

Lend-Lease had its inception nine months before Pearl Harbor. It was then that Congress passed the bill which authorized the President "to sell, lease, lend, or otherwise dispose of" to any country the defense of which he deemed essential to the defense of the United States, goods and materiel to the value of $1,300,000,000.

With the passage of this Act there came into existence within the Signal Corps a group whose responsibility it was to see that our potential Allies were provided, to the best of our ability, with various types of communications equipment, meteorological instruments, photographic material, and other articles essential to an army on the field of battle.

For eight months before Pearl Harbor this group had been receiving, processing, and completing requisitions placed by these nations. Hundreds of tons of equipment had gone abroad and thousands of items were coming off production lines in plants throughout the country.

Then came December 7, 1941, and it was necessary to temporarily freeze all this activity until our command could take stock of the situation and determine how best Lend-Lease requirements could be coordinated with the new and imperative needs of our own forces.

Actually the outbreak of the war had two effects upon the International Aid activities of the Signal Corps. First, it caused the contraction of the activity just referred to but, within a short time, it made possible a marked expansion. More and more industrial plants went over to 100 per cent war production, and, as a result, International Aid contracts were more rapidly completed and International Aid requirements more rapidly met.

Anticipating an increase in the volume of business, the Signal Corps unit streamlined its organization into the following three major sections with functional responsibilities: Requirements and Technical Section, Operations Section, and a Records and Reports Section. The first two units were designed as operational; their main functions were to process all foreign government requisitions and to direct the movement of materiel. Records and Reports Section was designed to prepare and maintain all records and reports for the branch and to furnish information to the operational units for expediting purposes. The effectiveness of this farsighted planning in revamping the organization has borne fruitful results.

By the introduction of the best business practices and the installation of more advanced record systems, the Branch was able to eliminate duplication of unnecessary work in the operating sections, channel all information through one central source, and produce accurate reports more promptly.

A comparison of the fiscal years 1942 and 1943 shows that monthly transfers were doubled or tripled in volume in 1943, as against the corresonding months of the previous fiscal year. Shipping tickets, received and processed during the first six months in 1943, exceeded all of those received in 1941 and 1942. During these periods, thousands of telephones, telephone poles, telegraph sets, radio sets, radio transmitters and millions of bits and pieces, such as resistors, relays, plugs, and jacks were sent abroad. In addition, other kinds of radio and electronic equipment, meteorological instruments, and photographic appliances were furnished to our Allies.

During the first six months of the year, 233,483 miles of wire were transferred to beneficiary governments. Cumulative shipments of wire, as of the close of the fiscal year, amounted to 1,303,886 miles—enough to extend from Washington to Tokyo approximately 167 times.

While only three countries received direct aid when the Branch began operations, the number of Allied nations, which benefited from Signal Corps Lend-Lease aid during the fiscal year 1943, was thirty-four.

Not only have direct shipments of all kinds of supplies been of substantial value to the United Nations but the countless amounts of communications devices that have been installed in planes, tanks, and other mobile equipment and which were not reflected in Signal Corps International Aid transfer statistics, also played a tremendously significant part in Allied successes.

All equipment does not go to the combat zones. The British have standardized their interior communications to a large degree on American equipment. They have depended on American manufacturers for their maintenance parts which are supplied through International Aid.

(*Continued on page* 338)

SIGNAL UNIT SURVEY BRANCH

The Signal Unit Survey Branch is responsible for the development, procurement, installation, etc., of SC sets.

By Col. ROLLAND E. STAFFORD



Born in Grand Rapids, Michigan, in 1888. He was graduated from the Army Signal School in 1928. He served with the A.E.F. in the last war. He was an Electrical Supervisor with the Southern Pacific Railroad. Served as an Assistant to the Signal Officer, 2nd Corps Area, 1930-34 and the same capacity, Philippine Department, 1934-36. Commanded a Signal Battalion in Iceland in 1942-43 and was appointed to his present post, upon his return from overseas duties, in 1943. He is Chief, Signal Unit Survey Branch, and is holder of the Silver Star, awarded in last war.

SO MUCH has been written about the important part that communications play in the prosecution of war, that this statement hardly bears repeating. However, the maintenance of communications in modern warfare, involving rapid movement and simultaneous land, sea, and air operation in theaters all over the world, has placed on the Signal Corps terrific responsibilities for the development, procurement, installation, maintenance, and operation of new and highly specialized communications equipment. It has required the development of new techniques and, most important, the training of many different specialists to high degrees of technical skill, to use these techniques and to operate and maintain the complicated modern communication equipment.

As a result, the efficiency and skill of the individual Signal Corps specialist and the ability of Signal Corps units to perform their many and varied missions have become matters of extreme importance.

It was in recognition of this fact that the Chief Signal Officer activated the Signal Unit Survey Branch on January 18, 1943. The purposes for establishing such a Branch were threefold: First, to make inspections of Signal Corps troops for whose training the Chief Signal Officer was responsible; second, to meet the requirements of the Inspector General, Task Force Commanders, and the Commanding Generals, Army Ground Forces, Army Air Forces, and Army Service Forces, for technical assistance in the inspection of Signal Corps units of those Ground, Air, and

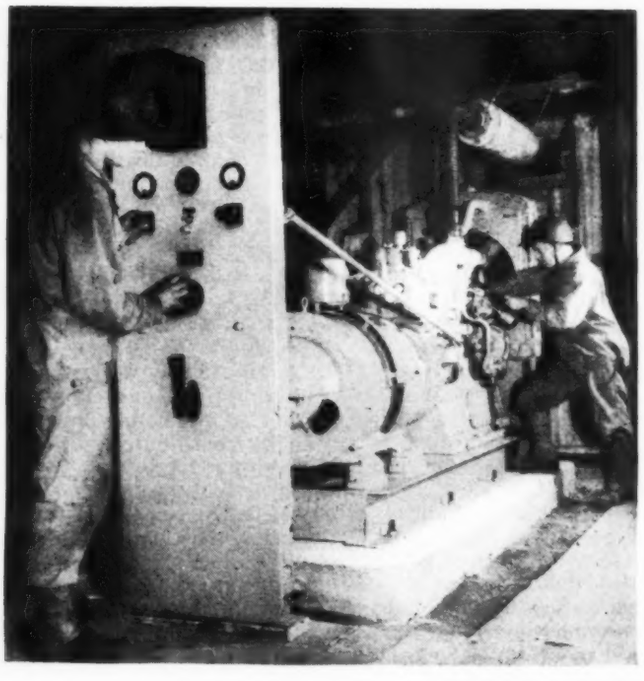


Electrical cable for use in construction of military camp.

Maintaining communications during amphibious operations.



350 kw. power unit used to supply power to large transmitters.



Service Forces, alerted for overseas movement; and third, to accumulate data on deficiencies on the basis of which corrective action could be initiated to insure that units are properly manned, trained, and equipped to perform their missions efficiently.

"Inspections," so much a part of Army life, are looked upon by all Army personnel as having the primary objective of "finding fault," "being critical," and "hanging someone." Because it was desired that the activities of the Branch should be directed towards constructive suggestions for improving training, organization, and equipping of units, it was decided to substitute the word "survey" for "inspection." The words are synonymous, but the substitution has proved valuable from a psychological standpoint. Therefore, the name selected for the Branch was Signal Unit Survey Branch.

The Signal Unit Survey Branch was organized by Colonel Fred G. Miller, who conceived and developed the organizational plan and methods of operation; selected the personnel; and directed its activities as Chief of the Branch until September 13, 1943. Colonel Miller, by virtue of his broad Signal Corps experience, his technical knowledge of communications and his long and varied military experience, was well qualified for this important task. He was a National Guard officer from 1908-1918, serving as Division Signal Officer, 7th Pennsylvania Division on the Mexican border, 1916-1917; saw service overseas as a Division Signal Officer, 1917, with rank of Lt. Colonel; was Assistant Department Signal Officer, Philippine Department, 1923-1925 and 1930-1931; Signal Officer, U. S. Forces in Shanghai, China, 1932; Signal Corps Board, 1933-1939; Signal Officer, 2nd Armored Division, and VII Army Corps, 1941.

The organization of the Signal Unit Survey Branch was determined after careful analysis of the problems involved. Important considerations developed from this analysis were as follows:

1. Signal Corps units should be inspected at the time of their activation; at least once during or upon completion of their Mobilization Training Program; and whenever alerted for movement to theaters of operation.
2. There were a large number of Signal Corps units stationed throughout the continental limits of the United States.
3. There were many different types of Signal Corps units (not counting an indefinite number of special teams) and many different Signal Corps specialists being trained by Signal Corps Schools.
4. Surveys of troop units required officers with field experience as well as officers with technical qualifications in the various specialized fields of wire, radio, aircraft warning, message center, pigeon, supply, and photography.
5. Scheduling and directing of surveys, initiation and follow-up on corrective actions, and necessary supervision and administration could best be accomplished from the Office of the Chief Signal Officer.

Therefore, the Branch was organized with Branch Headquarters in the Office of the Chief Signal Officer and five Signal Unit Survey Groups located in the field.

Locations for these groups were selected on the basis of concentration of Signal Corps activities; proximity to Signal Corps Schools and training activities and various posts, camps, and stations where Signal Corps units were located; and transportation facilities.

To each of these groups was assigned an officer in charge with broad Signal Corps and field experience. Officers qualified by technical training and experience in each of the fields of wire, radio, supply, and message center, were selected for each group, as these specialties are common to the majority of communications units. Specialists in aircraft warning, photography, and amphibious operations were assigned to those groups having a large number of these activities in their vicinity.

All surveys of Signal Corps units by the Survey Groups are scheduled and directed by the Branch Headquarters, Office of the Chief Signal Officer, Washington, D. C., the survey Groups operating as exempted field activities under the administration, supervision and control of the Chief Signal Officer. The Branch Headquarters secures information, from various sources, of activation, station, Tables of Organization, equipment, priority, training status and movement of Signal Corps units of the Army Ground Forces, Army Air Forces and Army Service Forces. From this information, survey schedules are prepared, and necessary directives issued to the Survey Groups giving them authority to make these surveys and furnishing them necessary information as to organization, equipment and mission of the units. Only surveys of Army Service Forces Signal Corps Units are initiated by the Branch. Surveys of Army Air Forces and Army Ground Forces Units are only made upon request of the Commanding Generals thereof or upon request of the Inspector General.



SCR-177-B radio transmitter located in underground dugout. Antenna is run up through trees outside and entire unit is operated by remote control from receiving position several hundred yards away, after adjustments have been made.

The Survey Groups make three types of surveys, "Initial" (Activation), "MTP" (during or upon completion of the Mobilization Training Program) and "Final" (when unit is alerted, or placed under movement orders, for overseas shipment).

At the "Initial" survey, the Survey Groups determine the following:

1. Capabilities of officers to command and discharge their respective duties.
2. Ability of the cadremen to instruct in their specialties.
3. Ability of the fillers to absorb the necessary knowledge.
4. That all training aids and instructional literature are available and that proper teaching methods are understood and will be employed. (This to include progress charts.)
5. That minimum training equipment is available.
6. That all necessary requisitions, reports, records, etc., are properly prepared, maintained, and rendered.
7. That personnel and equipment authorized is sufficient and of right type.
8. That all possible local action is taken to correct deficiencies noted.

At the "MTP" surveys, the Survey Groups determine the following:

1. Depending upon the state of completion of the Mobilization Training Program, that proper progress of individual efficiency has been attained (this by actual test of individuals).
2. That proper teams are formed and capable of accomplishing the team mission.
3. That the teams are capable of working with other sections in the combined mission.

(*Continued on page* 432)

Radiophoto

Pictures from foreign fronts are now seen in newspapers on the same day as "shot."

By Colonel CARL H. HATCH



Born in Massachusetts, 1904. He was a Plant Department Engineer with the Wisconsin Bell Telephone Company until 1940; entered the service as a 1st Lt. in Nt. Guard. Became Assistant to the Signal Officer, Fifth Army Corps, 1941; was placed in charge of all the telephone training and telephone facilities at Headquarters, Third Army. Appointed Assistant Executive, Signal Corps Replacement Center and assigned to Army Communications Division, Office of Chief Signal Officer, 1942; was assigned to present position as Executive Officer, Army Communications Service.

THE most complete pictorial coverage of any war in history is now being provided by the Signal Corps of the United States Army.

Scores of pictures are received daily direct from the battlefronts by the Radio-Telephoto Section of the Army Communications Service, sometimes with such rapidity that newspaper readers may see photographs of actual fighting the same day it occurs.

The Army, mindful of public news interest and the importance of public morale, has furnished an "as it happens" service through the medium of its Radio-Telephoto network, in which on-the-spot pictures are flashed to Washington with a minimum of delay.

A Signal Corps photographer at the scene of action shoots his picture and sends the negative by fast courier—sometimes airplane—to a transmitting station. There the negative is developed, a print made, and the picture is quickly on its way through radio channels. Seven minutes later a negative is stripped off a receiving machine in Washington and distribution of prints to news syndicates, magazines, and other publications is begun by the War Department Bureau of Public Relations.

In December of 1941 the possibility of providing telephoto service over Army telephone and fixed radio channels for the transmission of maps, charts, and pictures was

(*Continued on page* 316)



The first actual Signal Corps radio-telephoto news picture, March 18, 1943, showing gun crew on the alert in North Africa.



Radio-telephoto of American Infantry troops cautiously entering Acerno, Italy. Picture clearly shows many original details.

Small receiver through which pictures are transmitted to and from overseas points. Switchboard controls operating connections.



Famous Jinx Falkenburg test picture which was sent back and forth across the ocean over a hundred times during experiments.



SIGNAL CORPS PORTFOLIO

The Signal Corps in action—dramatized in the photographs that follow



NIGHT REPAIR



DIRECTION FINDER





MINE DETECTORS

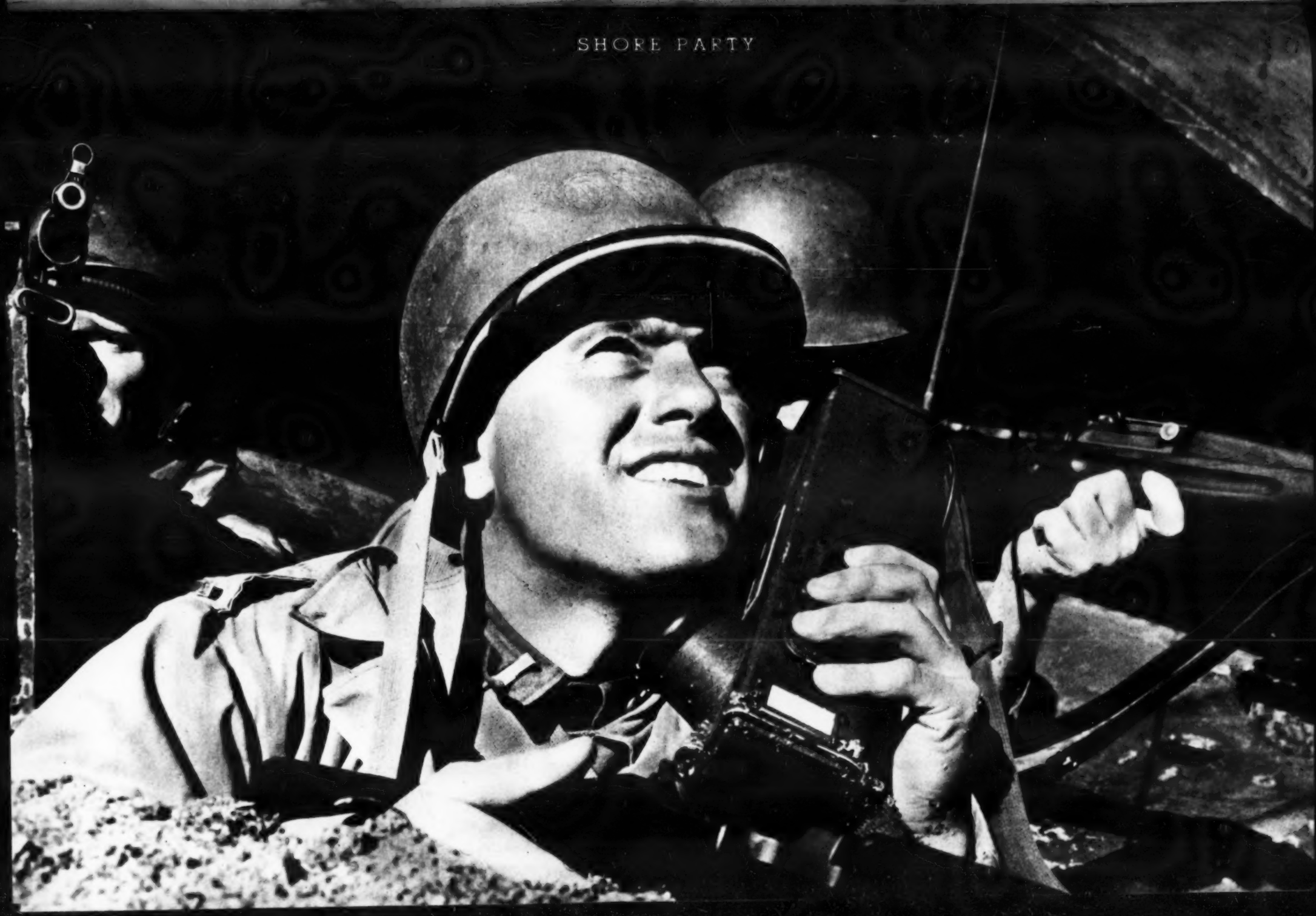


LINE REPAIR



WINTER MANEUVER

SHORE PARTY

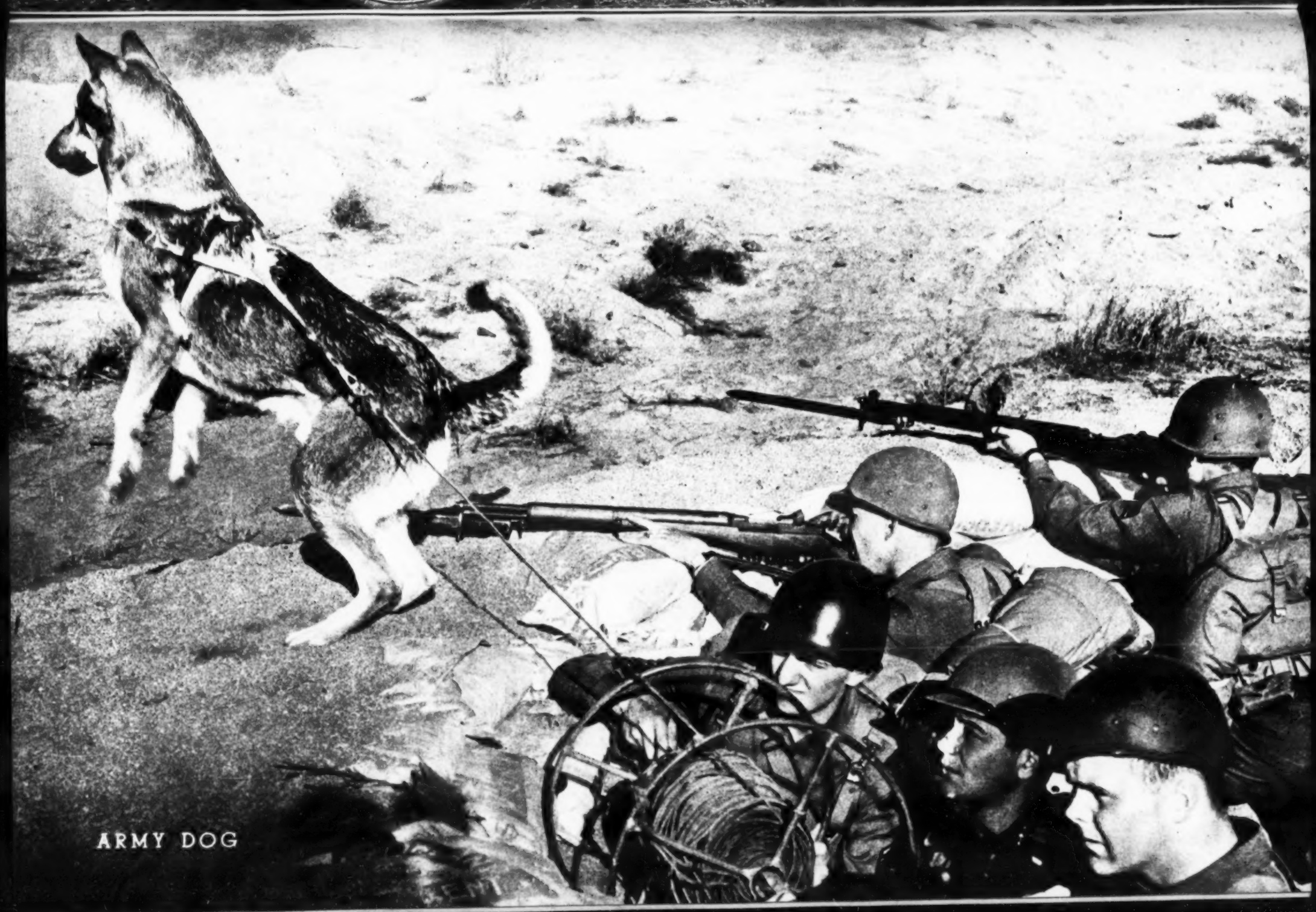



PIGEONAIRE



MESSAGE RECEIVED


WIRE CREW


ARMY DOG



EARTH BORER



WIRE TRUCK



TERMINUS

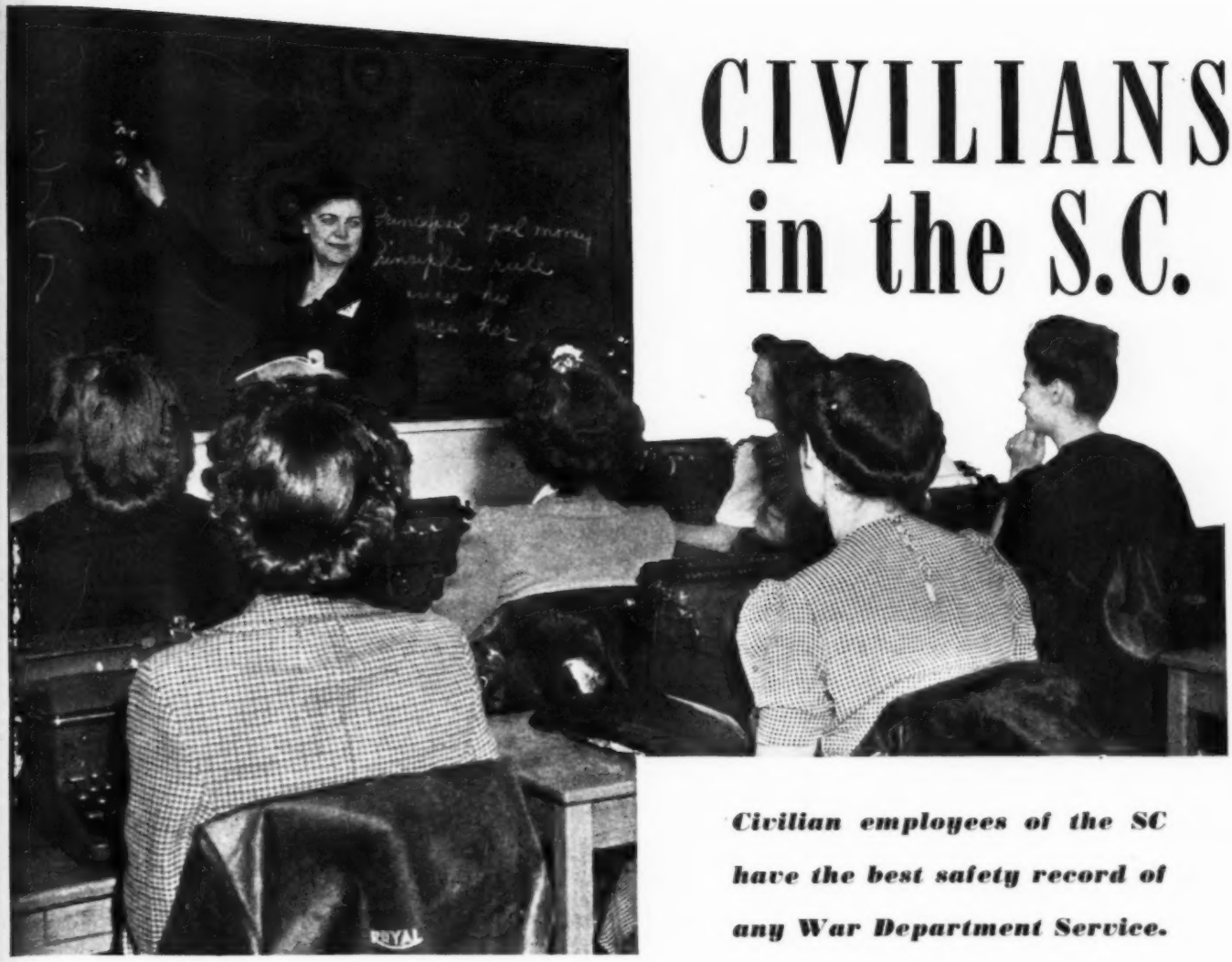


UNDER FIRE



MESSAGE

CIVILIANS in the S.C.



Many civilians are being trained for important positions.

Civilian employees of the SC have the best safety record of any War Department Service.

By Colonel HARRY O. COMPTON



Born in 1903. Was graduated from the University of Washington, receiving a B.S. degree in Electrical Engineering in 1926, and commissioned 2nd Lieutenant in the Officer Reserve Corps following his graduation. Worked with Pacific Telephone & Telegraph Co. doing traffic methods, personnel, and management. Entered active duty August, 1941; first assignment was organization of the Postal Censorship Station, New York City, which he headed until April, 1943, when assigned to his present position as Chief of Civilian Personnel Branch of the Signal Corps.

OUT over the packing cases and machinery, the desks and work benches, from a multitude of loud speakers, soar the stirring strains of the Star Spangled Banner.

". . . . O'er the land of the free, and the home of the brave."

As the final notes end, 8,000 men and women take up their tasks for a new day, one day nearer to a victory they will have had a hand in shaping. They are all civilian employees of the United States Army Signal Corps.

The scene above described is the Philadelphia Signal Corps Depot. But from coast to coast, all up and down the land, and in foreign countries the world over, other thousands of men and women in mufti are doing jobs of all varieties with the same single purpose—that somewhere, in some far-off land perhaps, grim men in olive drab can "get the message through."

There are more than 40,000 of these Signal Corps civilian employees.

Who are they? They are Mr. and Mrs. and Miss America. They are all ages. They are fresh from high school and back from retirement. They are all races. They are from every walk of life. They are earning the first dollar of their lives, and they have given up $100,000 a year to help the war effort.

They are workers and experts of countless kinds—accountants, executives, filing clerks, photographers, stenographers, warehousemen, instructors, electricians, engineers, draftsmen, cabinet makers, radio operators, and repairmen, crystal cutters, pipe fitters, tool and die makers, typewriter repairmen, janitors, charwomen, and laborers.

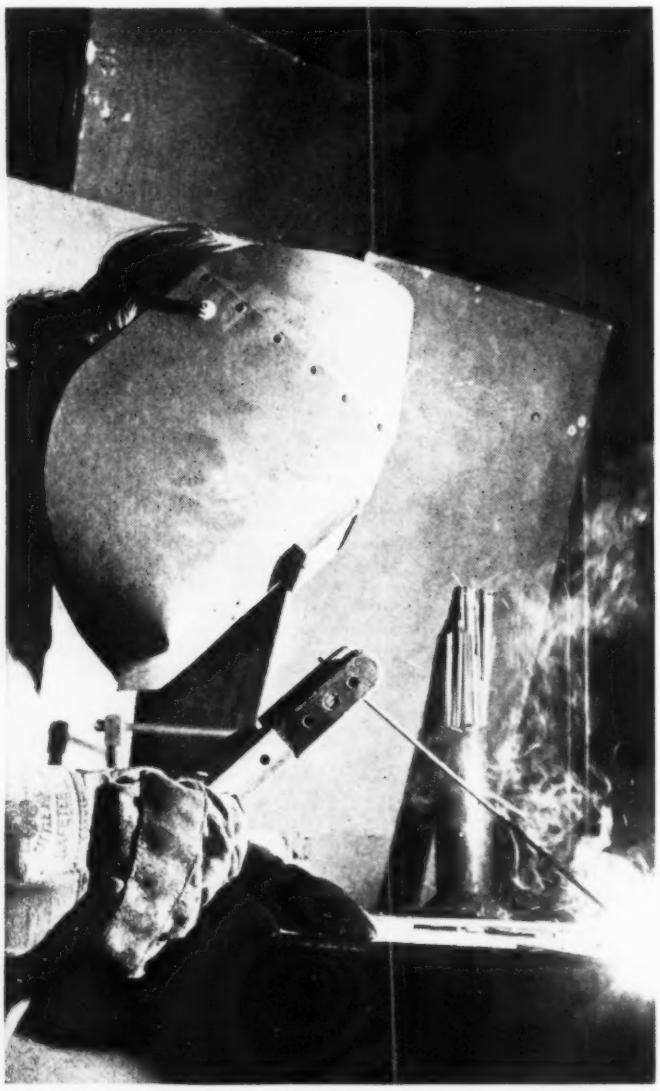
What sort are they? Statistics show that they are among the healthiest workers in governmental service. They keep absenteeism to a minimum. They have the finest safety record of any War Department service. They've never presented the Signal Corps with a "labor problem." They know they're doing their jobs for more than money, that they're working for the same thing their husbands, brothers, sons and sweethearts in the service are working for—the destruction of totalitarianism. They'll "step up the pressure" when there's emergency work to be done. Their war bond purchases lead other groups. Their own ideas and suggestions have saved Uncle Sam thousands of dollars. Those are a few of their attributes.

Though it may seem paradoxical, their numbers have



Signal Corps laboratory assistant performing a shaft-turning operation on a lathe at Fort Monmouth.

Graduate of a civilian training school operating electric welder.



decreased as the war effort expands. Only a few months ago, there were approximately 60,000 civilians working for the Signal Corps as against the 40,000 today. An analysis makes the reasons for this apparent.

On December 7, 1941, the Signal Corps, like all the rest of the armed forces, was presented with a gargantuan task, and a single, undeviating objective: to produce, to get the work out in the quickest possible time. American lives, America's destiny, depended on it. Never mind the precedents or lack of them, the questions, the "hows"—do it! If workers are needed, get them. If trained workers aren't available, train them.

From schools and colleges, from offices and laboratories and factories, from their garret and basement short wave sets, the Signal Corps recruited them. Radio hams by the hundreds answered their country's call for their talents and went to work for the Signal Corps.

They did the job.

Gradually, the Corps began to settle down to this job. Methods were modernized, systems were streamlined, labor-saving ideas were introduced, efficiency increased as untrained hands became familiar with their work, and tedious paper work was eliminated.

The mushrooming personnel problem was decentralized. Where, at the beginning, every step in personnel management had to be reported to Washington, field supervisors now hire, fire and promote their own employees. That saved tons of reports, hours of time and hundreds of extra employees.

Thus, at a time when the country was feeling the severest pinch of diminishing manpower, the Signal Corps was able to make thousands of workers available for pressing jobs and to save millions of taxpayers' dollars.

Being boss over 40,000 jobs, is a large job in itself. It involves payrolls, records, training, housing, safety, health, production, efficiency, long range planning, and even the problems of Mrs. Jones' expected baby, and Ike Turner's feud with the foreman.

So let us examine U. S. Signal Corps, Employer.

"The boss" is alert to employment opportunities.

Fifty per cent of the employees are women. Except for the Medical Department, with its to-be-expected high proportion of trained women workers, that is the highest average in the War Department.

There is nothing traditional about the occupations of the



Feminine worker at the Signal Corps General Development Laboratory adjusting vehicular-radio equipment.

Signal Corps women. They are truck drivers, guards, mechanical repair experts, executives, and inspectors passing on intricate mechanisms.

In many of their new jobs, they have proved superior to men. They are particularly adept at work of a highly repetitive nature, requiring light, manual dexterity. Monotony jobs are their meat. Where men tire and grow bored, woman's efficiency remains unimpaired.

"The boss" is interested in his employees' welfare.

Housing, health, safety, education, recreation and private problems, financial and otherwise, are the concern of the Signal Corps Civilian Personnel Branch. These activities are based on the proven theory that happy workers are efficient workers.

Recreational functions are designed to build a spirit of team work and knit the employees into a co-operative family. Dances and other social affairs are arranged.

Off-duty classes are conducted in such subjects as French and Spanish. Self-supporting lending libraries have been formed. The importance of diet and rest are taught.

Counselling services have been set up where employees can take their personal troubles, anything from a domestic difficulty to an entanglement with loan sharks, and get sound advice and help.

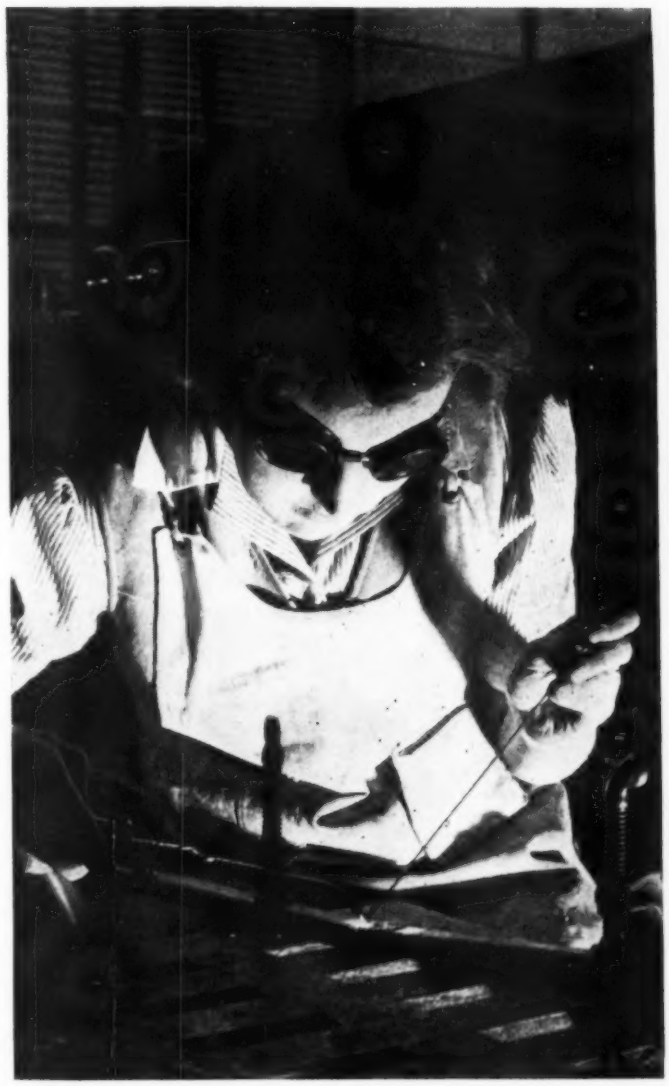
"The boss" makes a real effort to be fair.

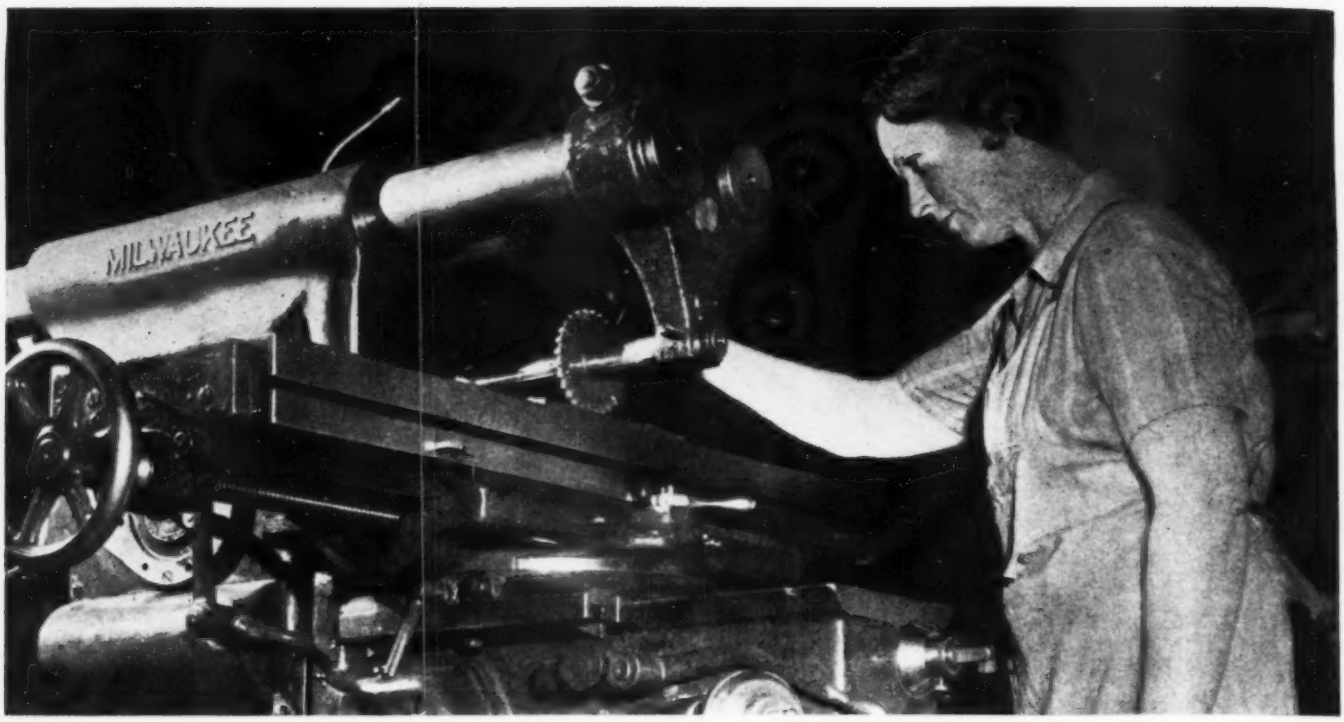
If an employee feels he is getting a raw deal, that he's in the wrong job, that his superior is mistreating him, or that he is being fired unjustly, he appeals to the Employee Relations Section in his installation.

If it is determined after investigation that the employee is being discriminated against or unjustly discharged or that his rights and privileges under Civil Service are being infringed upon, it is rectified. Often, the section has been able to make an efficient worker out of a poor one, by effecting a change of jobs. Sometimes it is a human obstacle, like a clash in temperaments. Sometimes it is a case of the right man or woman in the wrong job.

To every workingman and woman the most important factors in the administration of his job are the payroll and his vacation rights. Slipshod attention to these details can nullify all the other efforts. For that reason, the Civilian Personnel Branch has made it a rule that the payroll must be on time, if bookkeepers have to work all night for a week. Many of the Signal Corps personnel live on a small margin—thousands of them are in the civil service classi-

Welding radio-electronic equipment, using oxy-acetylene welder.





After completing her period of fundamental training, former sewing-machine operator now works on large milling machine.



Signal Corps inspector comparing raw quartz with finished crystal.

Civilian employee trained to operate high-speed tapping machine.



fications of $105 and $120 a month—and delays in the payroll can bring tragedy. Vacations of the Signal Corps employees are computed on a basis of accumulated time, and the same promptness is required in making available to them their record of time due.

"The boss" uses psychology.

Leaders may be born, but good leaders must be made. That is why the Signal Corps trains its supervisors in the best methods of getting the maximum efficiency from their subordinates.

They learn the value of words of praise and encouragement, and how to correct. They are taught that the object of criticism is improvement, not punishment.

It isn't school book theory stuff, either. The problems they study are their own, brought in by themselves from the shops, and discussed for the benefit of all.

Through Americanization meetings, often addressed by famous leaders in American life and returning war heroes, and through motion pictures such as the "Why We Fight" series and shorts showing the results of their work on the battlefield, every employee is made to realize the importance of his job. They supplement the continual activity carried on by printed matter and amplifiers, to inspire workers in Signal Corps installations.

"The boss" fosters enterprise.

One of the most productive schemes that has been initiated among Signal Corps personnel is the plan for employee suggestions. Cash awards for suggestions vary roughly in proportion to the amount of money saved by the idea. Suggestion boxes are conveniently placed for the personnel and the range of the suggestions that pour into them are limitless—inventions, improvements in machinery and methods, and valuable ideas for phases of the war effort far removed from the Signal Corps.

"The boss" trains his employees.

When the war came, the greatest of all the problems to confront the Corps was the lack of trained personnel.

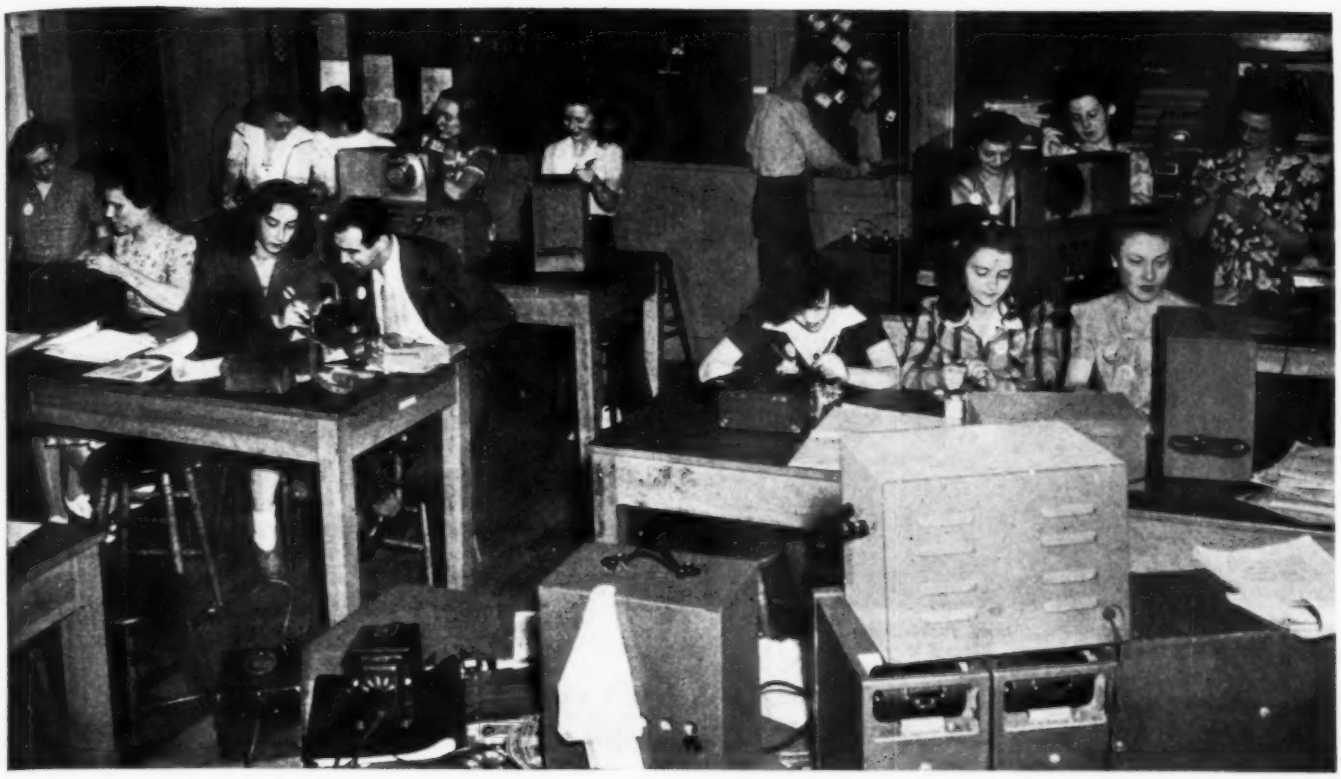
So the Civilian Personnel Branch went into the training business.

Training ranged from simple courses for typists to meet the stenography shortage, to elaborate courses in engineering.

An engineer can't be trained in a flash, so those that were available had to be spread out thin. To do this, the Signal

(*Continued on page* 438)

SOLDIERS IN MUFTI



Women learning radio and telephone repair at the Philadelphia Signal Depot. 10,000 have been trained since 1941.

Civilian personnel of the Corps wear no hero's garb.

By 2nd Lt. M. SONTHEIMER



Author of "Newspaperman," he started his career as reporter and feature writer for various leading newspapers in the East. This experience led him to the San Francisco News where he held positions as Assistant City Editor, City Editor, and News Editor. He entered the Army as a volunteer in 1942 and was graduated from the Signal Corps School in June, 1943. He was on temporary duty in the office of the Chief Signal Officer from July until September of that year. At the present time, he is serving overseas in the Signal Corps Division of the United States Army.



Radio-operating room of a military station in Atlanta, Georgia. Civilians have relieved many military personnel for active duty.

AT FIRST animals fought with fang and claw and hoof and lashing tail. Paleoethnic man emulated them until one human swung a club and another heaved a rock. Then conflict became a war of weapons. The club was sharpened into a knife and the knife became a spear and the spear became an arrow and each made a different kind of war.

Soon man set fire to his enemies' villages, and fire became a weapon of war. But to set fire to your enemy's property you had to touch it and he could kill you before you got that close, so that was not altogether successful. Then some pelt-clad warrior hurled a torch! And some sage tactician fitted the torch to the arrow.

Later a slant-eyed scientist of old China, experimenting with combustibles, found a formula for one that would explode! Then conflict underwent a radical change and we had the war of munitions.

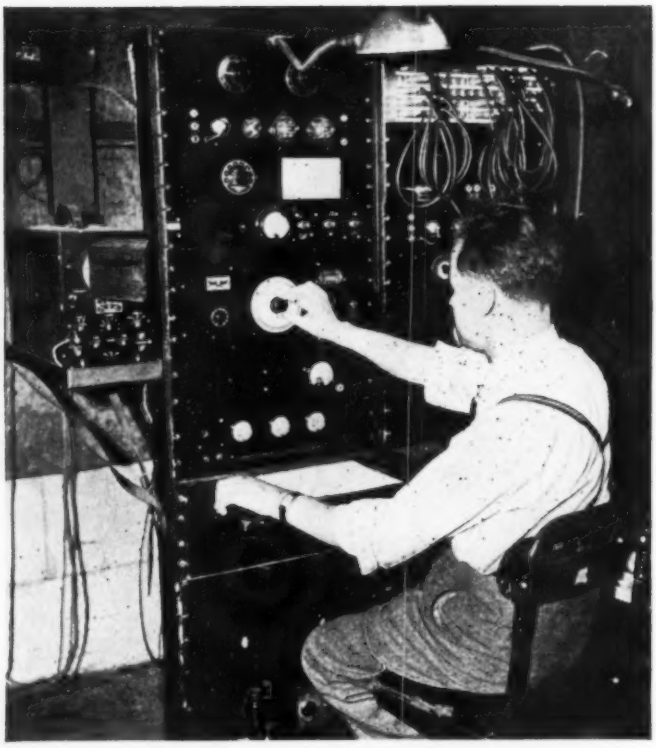
Alexander put his troops on elephants and Atilla mounted his on horses to scourge the civilizations of their days and to change the ways of war.

In our times the automobile and the airplane gave war a whole new suit of armor and from it evolved forts on flexible wheels that moved through forests and over shell craters; forts on wings that dumped death by the ton.

That was "mechanized war." It had its inception in World War I, and not by any means in this one.

In all of those conflicts, even that first mechanized one, armies met armies, each time on some given battlefield, and that was the war. Not so today. This is the war of the peoples. The War of the Nineteen Forties wears a

(*Continued on page* 404)



Radio engineer—obtaining data from curve-tracing equipment.

The RADIO INDUSTRY

To meet the demands for our Army supply program—the manufacturers have given their maximum efforts. The suppliers are "doing a job."

RADIO used as an instrument of war is incomprehensible to most of us for whom radio is associated with the finer things of life. Very few people can visualize it as an aid to the destruction of a ruthless enemy, yet today radio is serving on every battle front, on every ocean and in every sky. The very same elements that make up peacetime radios are contributing to the winning of the war and the same industry that produced these radios during peace today is geared fully for war. The complete mobilization of the industry, which has been in effect since early 1942, is the most all-embracing that has ever been seen in the history of our country. Men, materials, ideas, plants, and management are all harnessed in a stupendous effort to supply the finest communications equipment made in the world today to our Armed Forces. Production demands have continually been increased and yet these records have continued to be broken until we are producing at an all-over rate of better than 2000 per cent of our normal peacetime operation. The record here set forth can delineate only part of the outstanding achievements of an industry that is essentially American in character, ideas and performance.

Management

An examination of the problems which faced management at our entrance into the war, foreshadowed the tremendous strides which the industry was to make. Immediately following Pearl Harbor, the radio industry which had been, up to that time, supplying only a portion of its output to Lend-Lease and other Government services, was asked to convert 100 per cent to war production and to supply every communication need for our Armed Forces in whatever quarter of the globe they were to be stationed. The problem of major importance to management was the increased production necessary entailing decisions regarding space, manpower, finances, and materials. The space problem was generally solved in one of two ways; either the plant was expanded by renting additional adjoining space or entirely new plants were built with materials supplied under priority assistance from the Government, although many times a combination of the two methods was used.

Manpower was one of the foremost problems of management. While the status of the radio company employee has undergone many changes, it still remains in a very critical state as far as the radio industry is concerned. In its fight for ever increasing production, the addition of women, upgrading and training were tried but none of these proved to be the complete answer.

The local draft boards were, by law, no respecters of persons—so naturally many key men were withdrawn from plants, thus further complicating the manpower situation. Common sense on the part of management, the cooperation of local draft boards, and the aid of the W.M.C. were utilized in devising a plan of orderly withdrawal of men from industry. However, the problem remains unsolved, since there still remains such factors as training, absenteeism, rapid turnover, and inadequate supervisory personnel to be considered. As each of these problems arose, the Government, in cooperation with the manufacturer, tried to find the answer, but a failure to find the solution leaves the greatest problem in the industry.

Finances became one of the manufacturer's minor problems, since with the letting of large contracts by the Government, the manufacturer became a good credit risk, both to his bank and to the Government, which made it possible for him to borrow the neceessary money to carry on his business under wartime expansion.

However, the need for more money to prosecute the war laid additional burdens on management in the form of additional excise and income taxes. This, coupled with the tremendous amount of paper work necessary to keep track of withholding taxes of employees, might well have formed a stumbling block in an industry less well organized and less used to employing large numbers of people.

Materials were perhaps the greatest bottleneck in the whole setup, for with every manufacturer increasing production and each needing almost the same materials, chaos was inevitable. The advent of priorities on raw materials gave the manufacturer an entire new set of headaches, as whole departments had to be set up to handle the material problem. One of the major tasks of such departments was the filling out and answering of the flood of Government forms without incurring the penalties which were prominently displayed on each. From priorities, the industry progressed to the C.M.P. and the attendant complications which for a time seemed unsurmountable. The situation has now improved to the point where restrictions have been eased on many of the critical materials. This trend will no doubt increase in tempo from this point on.

In total conversion, such as the radio industry was undergoing, peacetime methods of operation had to be discarded. Among these changes were those of normal distributor and consumer operations, upon which the industry had been built. Efforts were made in almost all cases to distribute efficiently and fairly any remaining stock of civilian merchandise and to protect, as far as possible, the distributor who is so important in normal operation of the radio industry.

It is to the credit of the manufacturers in the radio industry that when they were faced with this demand on their resouces, all responded to the best of their individual abilities. These men gave unstintingly of their time and placed their entire businesses at the command of the Government. For the first time in the history of the industry unified cooperative action was available, individual and personal considerations were forgotten and the supplying of the communications needs of the armed forces became the only goal.

Engineering

The engineering problems posed by the war were of a very complex nature, and while not entirely foreign to the engineering procedures used in the peacetime industry, they, nevertheless, had to be solved before economical and efficient operation of a war plant was possible. One of the more serious problems which engineers had to face was the archaic specifications used by many Government agencies. Another problem was the lack of unanimity in engineering thought and action between the various departments of Government and industry. It became necessary almost immediately for engineers to clarify specifications, to decide upon a unanimous policy, and, greater than all the rest, to so present this problem to the various Government agencies that they, in turn, could begin to have a common course of action in engineering matters. The Procurement Division of the Signal Corps did much to bring about the fulfillment of this idea of straightline engineering thinking, both in specification and performance.

Prominent engineers of executive caliber were drafted into Government service; other engineers were taken directly into the armed forces where their talents could be most useful to the war effort. Through the coordination of the aforementioned agencies and these engineers, order began to emerge out of chaos; specifications which varied from company to company for the same type material were changed so that any company capable of supplying any need of the Signal Corps was able to use a standard set of working specifications.

In examining the structure of the engineering departments of the manufacturers in the radio industry, it was found they were of three general types. First, the large, well-organized, efficiently operating engineering department of the larger company; second, the medium, fairly well-run engineering department of the smaller manufacturer; third, the poor, or practically non-existent type which was prevalent among the very small manufacturers in the industry. It became evident immediately that in order to receive the maximum amount of help from the medium and very small engineering departments much work would have to done; since these departments were relatively poor in men and equipment and had little or no idea of correct engineering procedures.

In the letting of contracts by the Government, one of the major considerations was the type of engineering departments available. In the case of the large manufacturer

Typical radio-assembly plant laid out for high-speed production. T17 microphones are being assembled, inspected, and tested.





Testing raw materials. Many new substitutes for critical materials have been developed by the radio research engineer.

contracts could be let immediately since adequate engineering staffs were available to put them into production. In the case of the medium-sized manufacturer, greater care had to be exercised since some of the engineering departments were not equipped to do more than a small amount of production engineering. The smallest manufacturer, of course, was in no position, either from a design or production standpoint, to take advantage of Government contracts.

The Government wisely decided to take advantage of all types of manufacturers by its "bits and pieces" program. By that is meant that all communications equipment was broken down into its component parts and each manufacturer could, according to his ability, contribute his share to the completed product. This permitted a high degree of specialization which resulted in a much better type of equipment.

Soon after manufacturers began to supply materials to the Signal Corps under this program, engineering departments began to give a great deal of thought to the re-designing and to the re-writing of specifications for communications material. As a result of this cooperative program, many changes in design were effected which brought about a better product than was available before. Perhaps the greatest problem which these peacetime engineers faced was the realization that the manufacturer of communications equipment to Government specifications presented new and more rigid requirementts than those with which they were accustomed to working. This challenge became a stimulus to finer engineering performance.



Operators assembling bakelite cases. Automatic high-speed guns are used to increase production of electronic equipment.

It is evident that the need of manpower in the engineering field, as the result of this expanded Governmnt program, would become acute. This proved to be the case, and industry and Government were forced to take suitable action. The problem was attacked in a number of ways; first, junior engineers who showed some talent were up-graded and given more responsibility; second, the Government sponsored tuition-free courses in a large number of engineering subjects in most of the trade schools and universities of the country, where specialized knowledge of engineering subjects could be gained by attendance after working hours by interested engineers, third, students, both men and women, were given training in engineering and laboratory methods which enabled them to be taken directly into the engineering departments, in a junior capacity, to fill the need for laboratory technicians and other beginner-grade engineers.

At this time, the Government decided that the senior or executive engineers in many of the plants could be of further service by serving on technical boards and committees in an advisory capacity to Government. It is to the credit of these men that even under this additional burden they were able to discharge their obligations in so outstanding a manner that our engineering production has far outstripped that of our enemies. Another very serious bottleneck developed in the engineering laboratory due to the lack of adequate testing equipment. With the tremendous demands made upon them by the Armed Forces, the test equipment managers were not able to keep up with the requirements for the laboratory-type equipment neccessary. This was a serious handicap for a time until sufficiently high priorities were given to engineering laboratory orders to enable them to compete favorably with the armed forces and other agencies for a supply of this equipment. One good result of this program has been to make available laboratories more completely equipped than ever before, which fact, no doubt, will contribute heavily to the maintenance of an engineering output of high caliber in the postwar period.

On the whole, the engineering laboratories of the industry have completed 12 to 15 years of development under ordinary conditions in a short two years. This was made possible by several factors: one, the increased manpower which industry was able to bring to bear on its problems stimulated the output of the laboratories; second, many improvements which were in the laboratory state of development but which had not been developed commercially, were brought up-to-date and released; and third, many developments which, for one reason or another, had never gotten out of the laboratory stage, were now completed and put to useful service.

In discussing the achievements of the laboratories, we must not overlook the most important element, the engineers themselves These men worked long hours of the day and night, and drove themselves unmercifully in order that American "know-how" might overtake and surpass the head-start which our enemies enjoyed. They would be the last to asked any recogniition for this outstanding performance, but the industry and the nation would be very remiss if recognition were not given to their contribution to the war effort.

The engineers, by virtue of their war service, have elevated themselves from a mere department in industry to the management level where they have opportunities for greater service.

Production

Production, in the ordinary meaning of the term, concerns itself with men, methods and material. It is only by the skillful welding of these three elements that we are able to have a production weapon such as we have in the radio industry today. The greatest problem at the beginning of the war was that of factory manpower. Under the greatly expanded war production program, plant managers

(*Continued on page* 437)

FM in WORLD WAR II

Freedom from static and other noises is essential for vital communications. The SC FM sets are really "doing a job."



The new FM walkie-talkie. This unit has proven to be more reliable for local communications than its AM predecessor.

By
Major WILLIAM S. MARKS, Jr.



Born in Tennessee, 1900. He attended Naval Radio School at Harvard Univ. He was commercial radio operator for Marconi Wireless Co., and R. C. A. Received B.S. Degree in Electrical Engineering from Louisiana State Univ. He did postgraduate work at Union College & Rutgers Univ. Became a Radio Engineer in Signal Corps Laboratories in 1930. Was in charge, Radio Transmitter Section and Chief of the Vehicular Radio Section. Entered the service in July, 1943, and was appointed to his present position, Officer in Charge of Radio Communications Branch, Camp Coles.

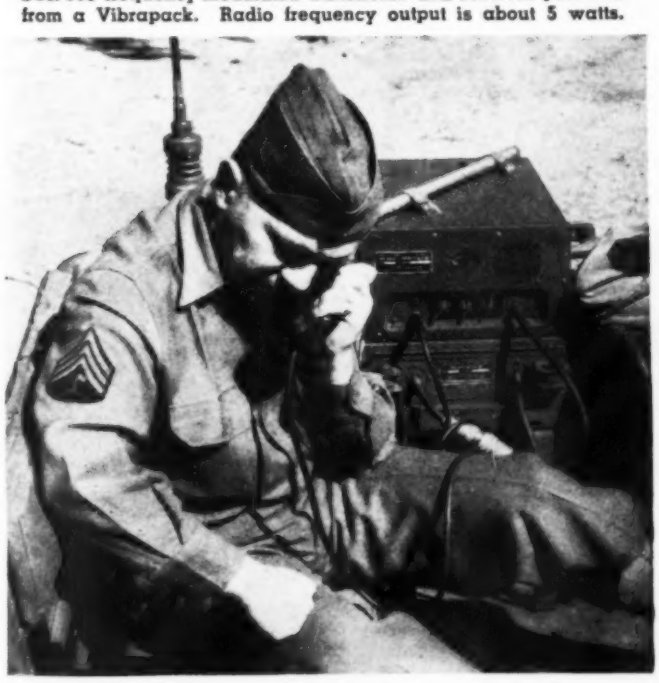
OUR Army's communication equipment is the finest in the world. Outstanding in performance are its FM radio sets, designed especially to meet the Army's requirements for "getting the message through." The American Army is the only army in the world equipped with tactical radio communication sets, utilizing the advantages of this latest revolutionary invention in the radio field.

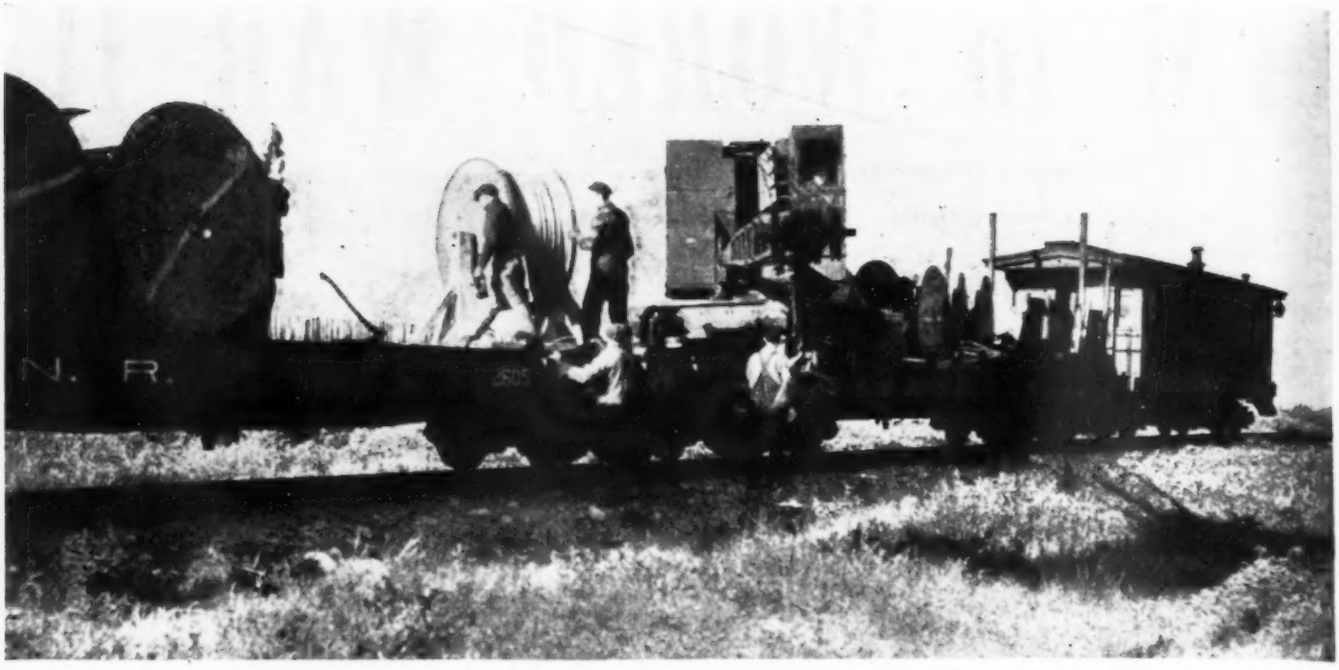
The success of an army in modern warfare depends more than ever before upon the reliability of its communications. The burden of coordinating the fast moving action of tanks, artillery, and infantry in battle has placed new demands on radio. These demands call for equipment providing the utmost freedom from ignition and electrical noises, static, and interfering signals. The sets must be as simple to operate as a field telephone. Their communication range must remain unaffected by time of day or night, weather or geographical location. All these requirements are being met by the Army's FM radio sets.

These FM sets developed by the Signal Corps Laboratories in cooperation with the radio industry are the result

(*Continued on page* 426)

SCR-610 frequency-modulated transmitter and receiver powered from a Vibrapack. Radio frequency output is about 5 watts.



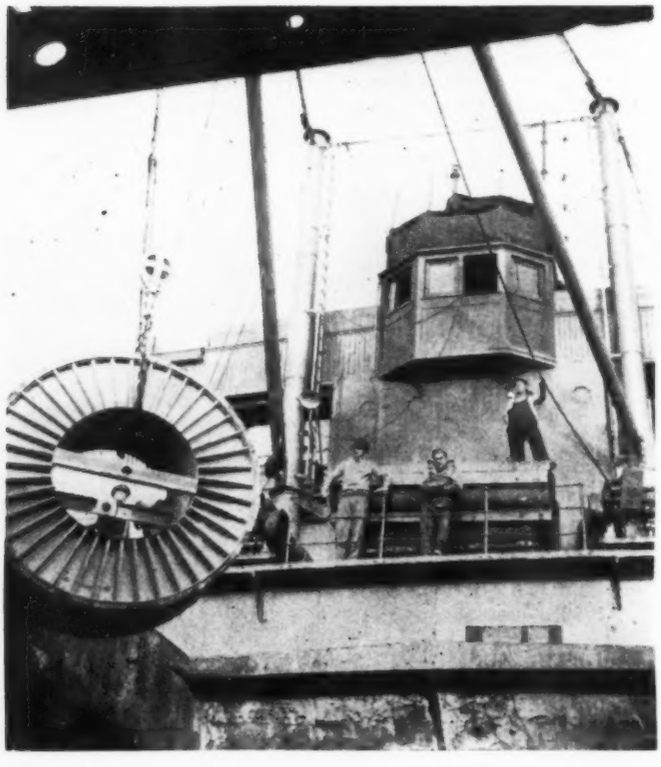


New cable in position on railroad car ready to be played out near Gandar, Newfoundland.

PLANT ENGINEERING AGENCY

The Plant Engineering Agency was established early in 1943 as a field agency of Army Communications Service.

Cable reel being unloaded from one of our many cargo vessels.



By Col. WILL V. PARKER



Born in Texas, 1884. Served in A.E.F. in World War I; awarded Purple Heart. Graduated from the Signal School, 1927. Served as Instructor, Signal School, 1920-23 & 1925-27. With Engineering and Research Division, Office of the Chief Signal Officer; Chief, Communication Division, 1927-31; 8th Corps Area, 1931-37; Assistant Signal Officer, Hawaiian Dept., 1938-39; Assistant Division Signal Officer, 36th Division, 1940-41; Signal Officer, 8th Army Corps, 1941; Plant Div., Office of Chief Signal Officer, 1942. Appointed to his present post, Director, Plant Engineering Agency.

THE Agency is responsible for the engineering, supply, construction, installation, and maintenance of fixed wire and radio communications of the Army—everywhere. What this means is that the Agency is doing a communications job equivalent to the amount of similar work done by all the telephone and radio companies in the United States in any typical year of peace. Its headquarters are in Philadelphia.

In the warfare of the past, the first requirements for troops were food and ammunition. Even a quarter of a century ago in World War I these were still the prime essentials. In this war without precedent, however, there are three requirements of first importance—food, ammunition, and communications. To win we must have better food, better ammunition, and better communications. We must have better communications due to the speedy movement of troops and equipment over large territories. A commander must always be in touch with his various units, wherever they are, through every echelon of organ-



Radio-equipped military cars of the 33rd Reconnaissance Troop.



Vehicular-mounted radio being used during amphibious operations.

ization. And those units are moving as they have never moved before. This makes communications service more vital than ever before.

The Plant Engineering Agency deals only with fixed Army communication installations. The mobile units of communications used in the actual battle zone are handled by other organizations in the Signal Corps. It is where territory is wrested from the enemy—as it has been in North Africa, Sicily and lower Italy, in the Mediterranean Area and Guadalcanal, New Guinea and other islands in the Southwest Pacific—and the American forces plan to hold this ground against counter-attack, that the Agency steps into the picture. It is there that its engineering and supply services culminate in the installation of permanent or fixed radio stations and in the establishment of complete, permanent telephone systems. It is then that the troops assigned to the Agency keep these installations in repair and operation.

Obviously military necessity prohibits being specific but a hypothetical example will give some idea of the work involved by this agency. Let us assume that offensive operations are to begin in a territory that stretches from the sea along a line 700 miles long, flanked on the right by another natural barrier—an impassable mountain range. Within this immense area, there are several important cities that must be captured and held before the operation culminates in a successful action.

The task forces to be used in this theoretical offensive are comprised of the usual combat units—infantry, tanks, and artillery assisted by tactical Signal Corps units and by combat engineers. The advance and every phase of the action against the enemy must be tied in with the Command by field communications. Naturally the communications used will be of the mobile type—radios in tanks and planes, field telephones connected with light field wire, pigeons, runners, and the one-man radio stations—the handie-talkie and walkie-talkie.

While this imaginative combat area might comprise as much as 150,000 square miles, it would be no exaggeration to state that the offensive might end in a victory within a period of two or three weeks. Modern warfare moves at this breathless pace. The enemy is driven out. The territory is mopped up. The civilians in the area are under control. The land is under the American flag and will be defended against counter attack from the foe. The mobile communication facilities must be replaced—and replaced fast—by permanent or fixed installations that are as good and as dependable as the telephone and radio services that we are accustomed to here in the United States—and the installation of these fixed communications systems, radio, and wire, is the job of the Agency.

The Agency just doesn't wait around and get into action when the triumph is reported in the press. Its work begins the moment the plans of operation are approved by the General Staff.

With the facts at its disposal, plus the experience of the members of its staff, the Agency can determine in Philadelphia—thousands of miles away from the action—just what will be needed to supply the territory with the right kind of permanent communications. Most of the officers and many of the communications experts attached to the Agency are thoroughly experienced executives from the telephone and radio companies, who have been generously released from their civilian occupations in order to lend their skills to the winning of an Allied victory within the least possible time.

Agency engineers take the factors at their disposal and draw up plans and specifications for the type of installations that will be required to serve the Army in the

(*Continued on page* 439)

Destroying military equipment is imperative when capture is imminent.



Cable reels in hold of ship, prior to shipment to foreign ports.



The Signal Corps Wac

Women are playing a very important part in the Signal Corps by handling "man-sized" duties.

By Col. OVETA CULP HOBBY



Born in 1905. Graduated from Mary Hardin Baylor College and University of Texas Law School. Became Executive Vice President of Houston Post, Director of the Southern Newspaper Publishers Association, and a member of American Association of Newspapers. Member of Board of Regents, Texas State Teachers College. Served as Parliamentarian of Texas House of Representatives and as Assistant City Attorney to Houston, Texas, being appointed to the post of Chief of Woman's Interests Section, War Department Bureau of Public Relations, 1941. At present is Director, WAC.

FROM the inauguration of the Women's Army Corps, the potential usefulness of members, in carrying out Signal Corps duties, was recognized. Women's agile fingers and ability to stick to routine jobs for long periods of time without tiring had been demonstrated time and again in civilian life. Women could do equally well in the Army.

As far back as the first World War, the Signal Corps had recognized the superiority of women as telephone switchboard operators, and the advantages to be gained by using women to replace men, who would then be transferred to combat duties. About 225 women who spoke both English and French were trained as local and long distance operators and sent abroad. They were assigned mostly to the large military toll centers and to central offices where local traffic was heavy.

The success of these women in the first war made the Signal Corps anxious to obtain the services of members of the Women's Army Corps. The Chief Signal Officer was one of the first Chiefs of Service to contact WAC headquarters regarding the possibility of securing Wacs for communications duty.

In a few months, a number of Wacs were on jobs formerly done by soldiers. The competent voices of women soldiers were heard on switchboards in Army installations both in this country and abroad. Their nimble fingers were tapping teletype and telegraphic messages. They were entering the photographic and radio field of Signal Corps.

In preparation for the jobs which they would do, women in the radio field were given intensive training as operators and repairmen. Three schools were used: the first to open was the Midland Radio and Television School at Kansas City, Missouri. Later, opened were the United Radio and Television Institute, Newark, New Jersey; and the Keystone Schools, Inc., Hollidaysburg, Pennsylvania.

Women had been carefully selected for these schools on the basis of their Army General Classification Test—out of a possible score of 163 points, a score of 100 was ne-

Control tower operator giving instructions to a student ship for a take-off at Turner Field, Albany, Ga.

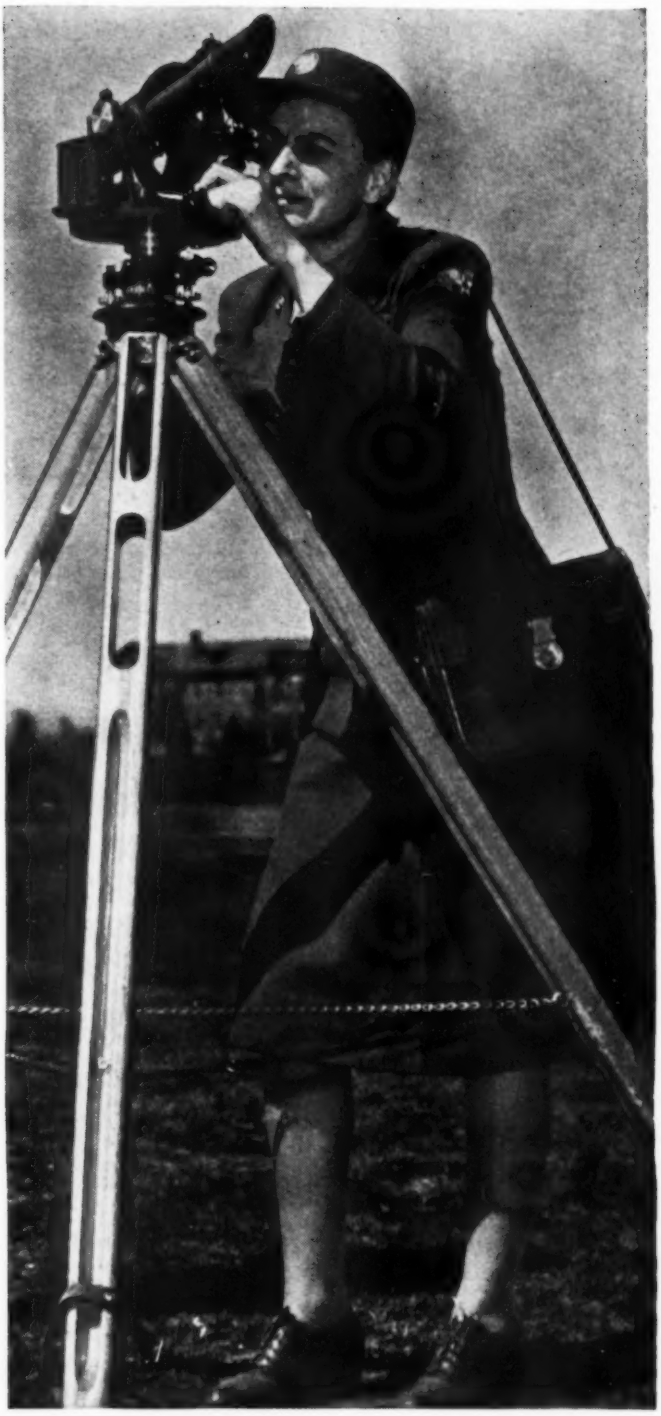




Wac with microphone, testing tower-to-plane radio communications.



Feminine radio operator sending and receiving coded messages.



Theodolite being used to record the wind velocity and direction.

cessary to qualify for the operator's course, and a score of 110 or better for the repairman's course. Women also were given the radio-telegraph operator aptitude test, in which they needed a score of 100 or better to qualify for the operator course. For repairman, a mechanical aptitude test score of Army grade 3 or better was required. To be an operator also meant that the woman was able to type at least 30 words per minute.

Women soldiers worked side by side with the men at the schools, tearing down radios, learning to wind coils, take voltage readings, splice wires, analyze circuits, etc. The instructors were amazed at the ease with which women became accustomed to the intricacies of building and repairing radio sets.

Other women, who had experience or knowledge of photography, were and are assigned to the AAF Photography School at Lowry Field, Denver. Wacs are being trained for Signal Corps duties there. They learned how to develop negatives and print pictures, how to mix their own solutions and repair cameras. By October, 1943, almost 400 had taken this highly technical course and had been assigned to positions in the field.

At Camp Crowder, Wacs are at work raising and training pigeons.

These, of course, are types of training in schools. Signal Corps instruction is also given on the job. A woman who is an excellent typist, for instance, will be able to learn how to operate a teletype machine in a couple of weeks at the post where she is stationed. Or she may learn to operate a telephone switchboard.

When the first feminine AEF in American history, landed in North Africa in January, 1943, a number of bilingual telephone operators were in the group. In a short time,

(*Continued on page* 406)



Carrying cage—used in the field to transport pigeons.

PIGEONS

New records have been made by Army homing pigeons. One recently flew 65 miles in but 82 minutes.

By Major OTTO MEYER



Born in Westerville, Ohio, 1905. Before he was called to active duty in 1941, he was a pigeon fancier; he was raising, breeding, and racing homing pigeons and carrier pigeons. After entering the service, he spent his time at Fort Monmouth, New Jersey and in 1942, he was assigned as Officer-in-Charge, Pigeon Section, Training Division, Office of the Chief Signal Officer. During the latter part of the year, he was the Officer-in-Charge of the Pigeon Branch of that division. He was appointed to his present post, Chief of Army Pigeon Service, in Spring, 1943.

THE homing pigeons of the Signal Corps have already made their mark in World War II, along with split-second radio and telephone communications. The first news of the recapture of Gafsa by our troops in North Africa was brought to Headquarters by "Yank," who made a ninety-mile flight through ugly flying weather in one hour and fifty-five minutes. "Yank," who was hatched in the Fort Benning lofts, was shipped overseas during the latter part of 1942. After landing in French Morocco with his many comrades, he was flown by plane to the Tunisian front lines for duty, along with other birds. If "Yank" is still living after this conflict, he will be returned to the United States to live as an honored veteran of World War II.

The most important flight accomplished so far in World War II was made by a pigeon named "Captain Fulton." The bird returned from the front lines in the vicinity of Bizerte, Tunisia, to its home loft, a distance of over sixty-five miles, in the short time of eighty-two minutes. The Blue Check Cock, "Captain Fulton," was named in honor of the late Captain Thomas J. Fulton of Pittsburgh, Pennsylvania, formerly the Commanding Officer of the Pigeon Breeding and Training Center, Fort Monmouth, New Jersey.

"Wisconsin Boy," a Blue Check Cock twelve weeks of age, was dispatched from the front lines at Tebourba, returning to its home loft making the distance of forty miles in forty minutes with a message from the U. S. 1st Infantry Division. This message was the very first news released to the outside world of an American advance.

In one day's time, after a mobile loft had been moved into Feriana, Tunisia, the birds were flown up to 135 miles with few losses. Between March 29th and April 4th, when the African campaign was pushing to a close, a total of forty-five "secret" and "urgent" messages were delivered

(*Continued on page* 410)

Army dogs bring the carrier pigeons to advanced positions.



Pigeon about to be released with message for headquarters.



PHOTOGRAPHIC CENTER

By Captain MILTON B. HERR



Born in Philadelphia, 1898. Attended Temple Univ. Served in Marine Corps, 1st World War. Graduated from Signal Corps School of Photography, Columbia Univ., 1918. Was editor of the Telephone News and member of faculty of Price School of Advertising and Journalism, Philadelphia. He served as an Officer in the Military Intelligence Division, Officers Reserve Corps, 1924-34. He was called to active duty in 1942 when he was assigned to his present position which is the Chief, Officer of Technical Information, Special Activities Branch.

Facilities for taking motion pictures are as elaborate as those in Hollywood.



Troops in training are taught, through pictures, the most approved methods of concealment to be used in combat.

WHEN the Training Film Production Laboratory early in 1942 moved from Fort Monmouth to the old Paramount Building in Astoria, another inspiring chapter was added to the history of the Signal Corps and to the history of visual education.

The studio was built in 1920 by the Famous Players-Lasky Company, and the original cost of construction, plus alterations made at the time of the introduction of talking pictures, was in the neighborhood of $10,000,000. For nearly ten years the studio was the center of production for Paramount films, and many great stars of that era made great motion pictures here.

The record reveals many "firsts" for the Paramount Studio in Astoria. The first really big picture made there was THE COPPERHEAD starring Lionel Barrymore. The first big musical was also made there. It was THE COCOANUTS with the Marx Brothers. Ginger Rogers scored her first big successes when she made SALLY, IRENE, AND MARY, and FOLLOW THE LEADER. A real milestone, however, was the making of the first full length feature sound picture, THE LETTER starring Jeanne Eagles. Autograph seekers haunted the doors of the studio in those days for the signatures of Rudolf Valentino, Gertrude Lawrence, Gary Cooper, Claudette Colbert, the Barrymores, and a galaxy of others.

Until the late 1920's Paramount made big pictures there with famous stars and then, although under the same aegis, the studio was used only for the production of short features until 1933. In that year Eastern Service Studio Division of the Western Electric Company took over. In subsequent years most of the pictures made here were of the industrial type.

Eastern Service was succeeded by Audio Pictures in 1938 and the studio was occupied jointly by that firm and ERPI. Its facilities were used for short pictures on industrial and even juke box movies. Much of the huge studio, however, was unused and it gradually took on an abandoned appearance. But early in 1942 when the Training Film Production Laboratory moved from Fort Monmouth into the old Paramount building, the studio became once again the center of great activity and production for Army Pictorial.

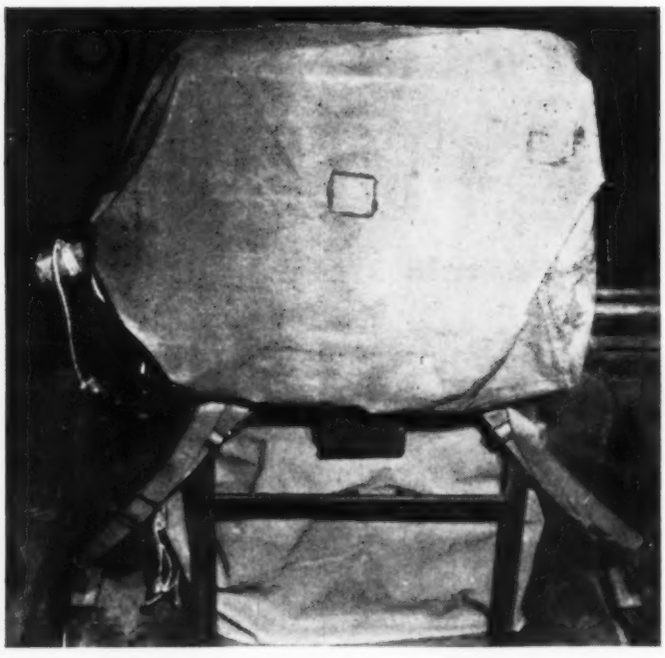


Message center in operation with radio station and switchboard. Films are used to show approved communication methods.

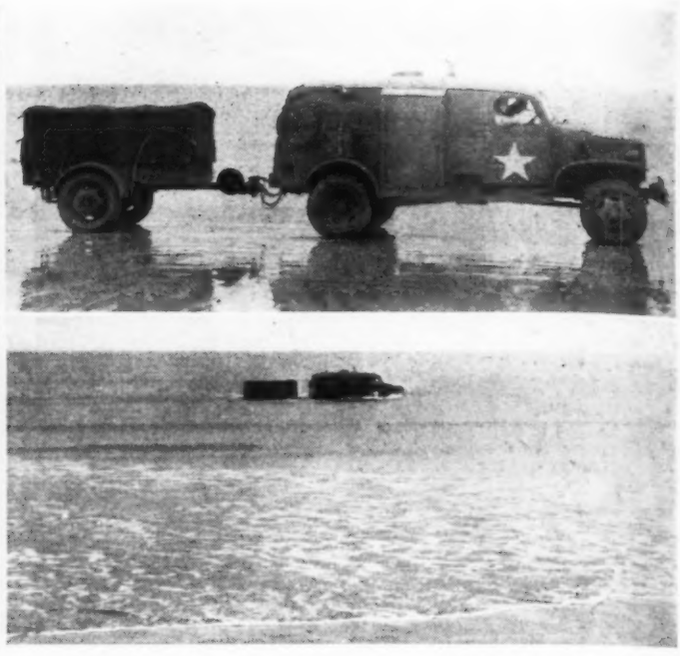
The history of training films dates back to shortly before the first World War with the making of social hygiene pictures by medical units. In 1917 the Signal Corps went to work and produced nearly 100 reels of training films before the Armistice was signed. For a while after that, although the value of these films was appreciated, the Government ceased production until 1928.

Along about 1928, however, the Government once again went into the motion picture field. The coming of sound tended to disrupt production at this point, but after 1932 a

(*Continued on page* 406)



Waterproofed radio equipment mounted in ¼-ton truck. All electrical apparatus must be protected against salt spray, etc.



SCR-299 radio set completely waterproofed for beach warfare. Lower photo shows the military unit operating in 3½′ of water.

WATERPROOFING

By Colonel R. C. HILDRETH

Unlike German radio equipment—American units are carefully waterproofed and protected from the elements and insects.

Born in Nebraska, 1887. Attended University of Nebraska; graduated Signal School, 1926. Worked for Nebraska Telephone Company as Supervisor, Foreman & Wire Chief. Served with A.E.F. & the Army of Occupation in World War I. Was Assistant Signal Officer, 8th Corps Area & 3rd Corps Area, Philippine Dept.; Supply Div. Officer in Charge, Storage & Issue Div.; Assistant Director Distribution and Field Service Div. Since latter part of 1943, he has been in present position, Director of the Signal Supply Division, Headquarters, S.O.S., European Theater of Operations.



THE Allied landings in North Africa, Sicily, and Italy, where thousands of soldiers with their equipment were disembarked from boats and other landing craft, required that the motor vehicles be waterproofed so that they would function during their journey through the surf to the beaches. Likewise, it was equally important that radio sets, especially the vehicular types installed in jeeps, command cars, half-tracs and other combat vehicles, also be waterproofed for operating in the water or immediately upon reaching the land.

The development of materials and methods for waterproofing vehicular and portable radio sets has been one of the important combat research activities of the Signal Corps in the European Theater of Operations. A special kind of waterproof compound, which has been developed by the Ordnance Service for waterproofing motor vehicles, was used together with canvas bags for the initial experiments. Amphibious operating conditions were simulated and a great deal soon was discovered about the damage to radio equipment that can be caused by salt water.

Salt water has a marked corrosive effect on aluminum and untreated brass and copper. Ordinary paint does not afford sufficient protection at all times. The rod antenna and the metal parts of antenna bases on vehicles, which are exposed to salt water spray, also require protection. It was discovered that the waterproofing compound was an excellent protecting medium in the absence of black asphalt or other waterproofing paints, which are not always on hand.

Low-power FM radio sets, which are used in large quantities in jeeps, require complete protection, because these vehicles are often almost completely submerged during landing operations. The use of a waterproof bag made from canvas, rubber or other suitable material was found to be the best protection for these and similar radio sets. Individual waterproof bags of various sizes were used to enclose the separate components of the larger vehicular radio sets. Each bag was designed for several types of radio sets or components in order to save material and to hold to a minimum the various sizes to be kept in depot stock.

A method of tying up the mouths of the bags to make a watertight seal was developed. Provisions also were made for the battery leads and other cables of the radio set to protrude through the sealed bag openings.

The protection of the vehicular radio set itself against water action does not complete the waterproofing job. It is just as important that the headphones and microphones as well as the handsets (used with some low power sets) be guarded because it may be necessary to operate the set in the water or a wave might splash over the equipment.

A simple protective device to accomplish this seemingly difficult task was discovered by chance. The cellophane



Handie-talkie with waterproof bag. This unit can be operated under extreme weather conditions when completely enclosed.



Waterproofed handie-talkie after receiving wade test. Each antenna connection is waterproofed with a special compound.

wrapper from a package of cigarettes, when placed over the receiver caps, was found to make an excellent seal. It excluded the water and did not impair the efficiency of the headphones. Improved cellophane material was procured and fitted inside the caps of receiver and transmitter units and the problem was solved.

The common handy-talkie set is treated in a similar manner. The waterproofing compound is employed to form watertight seals around the case of this portable radio set.

It is not always feasible to waterproof the higher power radio sets to permit operation during the trip through the water. In such cases, waterproof parts protect the various parts of the set. The bags are constructed so that they can be untied from the equipment and connecting plugs reinserted and the radio set placed "on the air" in a few minutes.

Waterproofed radio installations are made also in the all-purpose ¼-ton 4 x 4 truck, more commonly called the jeep. In these cases the waterproof bag is designed to permit the handling of the controls through the bag so that the radio set can be operated at all times. This is very essential in the fast-moving assault phase of beach landing operations.

The waterproofing job is made simpler when the radio set is inside a steel chest, as in certain motor vehicles. In these cases, the waterproofing compound is used to advantage for sealing the chest cover.

The higher power mobile radio sets, as the well-known SCR-299, require special treatment, especially for their trailer power units. Waterproof sheets and the special compound are the main basis for waterproofing these sets. A special waterproof sheet has been designed to protect the transmitter. Proof of the success of the methods developed for this set can be seen in the photographs.

The handy-talkie and carry-talkie radio sets are extensively employed by ground troops. The waterproofing technique for these portable radios was based on simple, practical procedures, easily mastered by the average soldier. The bags permit the radio set to be readily enclosed. In the case of the handy-talkie set, no difficulty is experienced in talking and hearing through the bag.

The waterproofed guidon staff radio set requires a few additional seals. There is no apparent reduction in the effective range of the waterproofed equipment.

In addition to radio sets, other items of signal equipment also have to be protected against damage from water action. Methods have been devised for protecting flashlights, telephone instruments, and even the mine detector, which is a most essential piece of appartus for clearing the way for our troops.

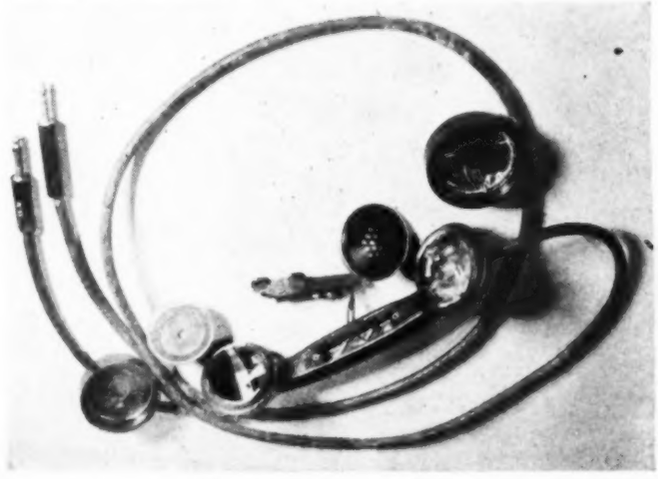
The procedures for waterproofing these items have been simplified so that the soldier can accomplish the necessary work with the minimum delay.

The importance of thoroughly waterproofing radio equipment for amphibious operations cannot be overestimated. A motion picture depicting the various methods developed recently was made in the ETO and it has been very useful for instructional purposes.

It should be borne in mind that the prime purpose of

(*Continued on page* 432)

Handset components. Cellophane and special grease are used throughout to prevent corrosion and electrical short circuits.





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Inspection Agencies

(*Continued from page* 120)

up a soldering iron before he gives his orders to the planes battling the Luftwaffe.

A soldered joint is a small thing, but it can make a $20,000 electrical unit worse than useless. A smart inspector checking a big radio transmitter, before sending it on its way overseas, may look first at the way wires have been soldered on, with sufficient heat to give a solid mechanical connection, no lumps, or dropped solder—a clean, efficient job that will not shake loose when a shell lands nearby.

The responsibility imposed on the individual inspector when he stamps a radio set "approved" or tags it as a "reject" is far from light. On the one hand, a faulty set sent to the front means waste, at least. On the other hand, an unnecessarily arbitrary rejection of equipment can interfere with vital production.

In his position as an impartial observer, the inspector frequently is able to make suggestions to manufacturers that enable them to cut down rejects and meet specifications or to improve efficiency of production. Inspectors also frequently conceive improvements in Signal Corps equipment which are passed on to the development laboratories. Often, these are incorporated in new designs.

Although there have been occasional instances of deliberate fraud in evading specifications, the vast majority of manufacturers are cooperative and are seeking only to turn out the maximum amount of equipment for the fighting forces. Sometimes, however, haste makes waste, and often manufacturers have difficulty in understanding that combat conditions require a rigid adherence to specifications that would be totally unnecessary in commercial equipment.

An inspector in a midwestern plant manufacturing aircraft radios overcame such a problem after conference with the management, when 70 per cent of the company's products was being sent back for changes after inspection.

"Why be so strict?" the inspector was asked. "Don't you know there's a war on?"

The Inspector pointed out that the equipment had to survive combat as contrasted with the treatment to which civilian radio is subjected. He related how a Signal Corps officer had demonstrated why a commercial police radio would not work in battle by taking such a set for a one-mile ride in a tank which shook it to pieces.

The company promptly effected certain changes, minor compromises were effected without weakening military specifications, and in three weeks, the percentage of rejections had dropped to 30 per cent. The number of completed aircraft radio sets climbed from 30 to 60, and finally, to 90 sets a day.

In another field, a Signal Corps inspector quadrupled the output of a western company manufacturing parachutes and bags for emergency sea-rescue equipment. Parachutes were being color-dipped and hung outdoors to dry. The result was a splotchy drying job and the time required for drying was dependent on weather conditions. The inspector first suggested an artificial drying process, which greatly speeded output but failed to solve the problem completely. He then hit upon the idea of using the facilities of a local laundry, and this simple expedient completely eliminated what had been a bothersome bottleneck.

Another plant encountered difficulty in turning out resistors that would meet specifications. The company was almost ready to give up, when a Signal Corps inspector devised a previously untried method of impregnating the resistors, and production went forward at once.

These are only a few of many instances in which cooperation and common sense have been able to solve production difficulties without relaxation of Signal Corps standards.

As has been indicated before, the manufacturer, who deliberately seeks to evade the terms of his government contract, is the unusual exception. Yet inspectors are prepared to deal with that type of situation, too, where a cooperative and helpful approach is of no avail. In one widely publicized case a Signal Corps inspector discovered that specially rigged test equipment was being used to give false electrical readings. The company and the individual responsible were punished by a federal court.

The Agency is proud of the record of economy it has maintained hand-in-hand with the simplification of procedure and greater efficiency that have been established. A survey, after the first six months of operations, showed that the cost of Signal Corps inspection was substantially less than one cent on the dollar of materiel inspected and shipped.

The Signal Corps Inspection Agency intends to continue patrolling the "quality sector" of the supply front for the duration, so that the labors of thousands of workers, technicians, and planners will bear fruition on the battlefields in equipment that does the job it is intended to do.

The Agency intends to see to it that when the hard-beset fighting man turns to his walkie-talkie in a tight spot, he will get through to his unit commander, that when the lives of men depend on a slender strand of field wire, that wire will not fail and that when the lone fighter-pilot is lost and desperately attempting to return to his home field on a dwindling fuel supply, his radio direction-finder will guide him surely.

The Agency knows that its responsibility is a heavy one but it accepts that responsibility and will do the job.

—30—

MP in the ETO

(*Continued from page* 213)

system. Very high frequency radio waves travel more or less in a line-of-sight direction; the higher the antenna, the greater the distance. Keeping the above in mind, selection was made of one of the highest buildings in each community, which also possessed a high and sturdy flagpole.

Preliminary tests indicated that the original location of the transmitter in the control room was unsatisfactory. This was due mainly to the long antenna lead-in with resultant losses in the coaxial cable. Therefore, the transmitter was mounted in a small hut directly below the flagpole supporting the antenna. This materially reduced the length of the coaxial lead-in. The receiver was installed in the control room together with a remote control panel similar to the one designed for the installation in the sedan patrol cars.

The remote control panel of the central station also incorporates a key and buzzer for tone calling purposes. C. W. tone signals can be sent, if necessary, for the attention of the various radio military policemen.

Provision is made at the base station for constant charging of the storage batteries supplying the transmitter.

Operations

Scotland Yard and the local constabulary of English towns maintain close liaison with the provost marshals and the military police. Telephone calls, received from Scotland Yard, are immediately relayed by radio to the MP radio cars for necessary investigation or action. A great deal of time is saved by this radio link. Petrol also is saved as well as wear and tear on tires by the expeditious dispatching of the radio cars.

An amusing incident occurred recently when a frantic request from a source, believed to be reliable, caused all cars to be ordered to converge on a main intersection in a large metropolis. When the MP's arrived, they found a soldier at a certain park being reprimanded by attending MP's for merely having his coat unbuttoned! He was not given a ticket but was taken on a ride to headquarters for a lecture on military bearing and discipline.

This network of military police radio stations is of great benefit to the civilian population as well as to military personnel. In the event of an air raid, soldiers and equipment, such as fire-fighting apparatus, ambulances, and even air raid wardens, can be quickly dispatched to affected areas. Traffic control and order are better maintained and the safety of the community is much improved by the military police radio system.

—30—

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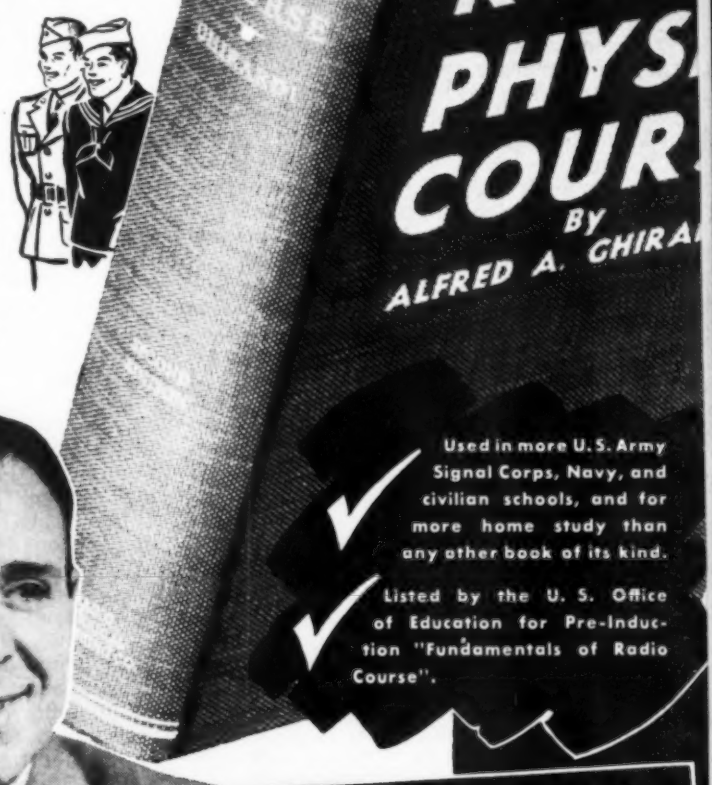
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Army Communications

(*Continued from page* 160)

these functions. In the interests of coordination and conservation of wire facilities, critical materials, and manpower, the domestic systems are being consolidated in the Army Command and Administrative Network, under the supervision of A. Com.

When the consolidation is complete, the wire network will include twenty-five principal centers which in turn will control many smaller sub-centers. The system will cover every part of the country, with direct connections between the principal points, with quick access to commercial means for sending messages into the smallest communities where Army messages may have to be delivered.

Among the few Army systems continuing to operate independently — those requiring specialized traffic handling—is that of the Air Forces. Out of a thorough A. Com study of Air Force requirements, however, has grown a closer liaison leading to a current plan to integrate two separate radio networks for the handling of all types of traffic in the Caribbean and South Atlantic regions. In addition to facilitating the primary objective of getting planes across to the fighting fronts, the consolidation will result in a saving of technically trained personnel, critical equipment, and radio frequencies.

Among the men responsible for the growth of the Army Communications Service, some have devoted years to their military careers; the names of others are familiar in civil technical fields.

Col. Carl H. Hatch, Executive Officer to the Chief of the Army Communications Service, came up through the enlisted ranks. Ideas gained during the 1941 maneuvers, a proving ground for the tactical use of teleprinter and telephoto, and for various other fixed equipment, such as commercial type switchboards, received a sound practical application when he began to participate in the supervision of A. Com activities. Formerly in the Field Artillery, Col. Hatch was later Executive Officer to the writer in capacities as Signal Officer of the Fifth Army Corps, Signal Officer of the Third Army, and as Commandant of the Signal Corps Replacement Training Center at Fort Monmouth, N. J.

Perhaps no one man has contributed more to the present efficiency of the Signal Center and WAR than Col. Edward F. French, Chief of the Traffic Operations Branch. Col. French, who has served with the Signal Corps continuously since the first World War, designed, planned and supervised the installation of equipment and facilities for the new Center in The Pentagon. He surrounded himself with experts and, despite the constantly increasing demands on the service, has always managed to have a margin to spare in capacity, equipment, and personnel.

Col. Ira H. Treest, Chief of the Communications Engineering Branch, also active in the Signal Corps since the last war, is a capable engineer who has been associated with all types of communications problems for thirty years. Before coming to Washington he was Signal Officer for the Western Defense Command and the Fourth Army.

The A. Com trouble-shooter is Col. William C. Henry, head of the special Cables and Long Lines Section. Col. Henry, for years a vice president of the U. S. Independent Telephone Association, brought a wealth of communications experience to the Signal Corps when he rejoined the service in 1941 after serving in the first World War.

Playing a prominent role in the development of the Alaska Communications System, one of A. Com's most interesting components, is Col. Fred P. Andrews. Col. Andrews is field supervisor of submarine cable, radio and wire installations that include the 2,000-mile line along the Alaska Military Highway, through the most rugged virgin wilderness in North America. It was under Col. Andrews' direction, too, that undreamed-of quantities of telephone, radio, and cable equipment were procured, shipped, installed, operated, and maintained as the Alaska system grew in importance.

Supervision of Plant engineering communications problems is the job of Col. Will V. Parker, director of the newly installed Plant Engineering Agency at Philadelphia. Col. Parker played a large part in plans for the agency, which procures and transports fixed plant equipment.

Much of A. Com's engineering success is attributable to Lt. Col. Vernon B. Bagnall, Officer in Charge of the Communications Facilities Engineering Section. A nationally recognized authority on long lines and radio communications in civil life, Col. Bagnall fostered many technical advances to keep abreast of requirements in this fast-moving war.

A former RCA traffic engineer, Lt. Col. Thompson F. Mitchell, is Officer in Charge of the Traffic Operational Engineering Section. Col. Mitchell is responsible for routing of radio and teleprinter traffic through continental United States and the world.

Development of important communication installations for defense projects in eight Pacific Coast states was under the direction of Col. Stewart W. Stanley, Chief of the Signal Branch, Ninth Service Command.

The Army Communications Service's job is to get things done, through the high-speed transmission of information and it is working overtime to see that the job is done as fast, as accurately, and as safely as it is humanly and mechanically possible. The motto that the officers in this service follow religiously is:

"Even a turtle must stick his neck out to get anywhere."

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Army Pictorial in ETO

(*Continued from page* 129)

plemented by APS photographs, which form an important phase of the APS activities.

The Army supply branches are constantly developing new items of equipment and searching for new ways to improve its utility—all of which must be photographed to enable reviewing boards to better grasp the effectiveness of the materiel.

A great number of photographs covering important military events and ceremonies are supplied for records which are invaluable for future reference. Among other items the daily routine of the APS includes servicing the official government Photo Mail and processing all film taken by Army amateur photographers in the ETO.

The Army's Public Relations Offices depend heavily on the Signal Corps photographers to supply photographs for press releases. This includes a recently organized photo news section, whose job it is to see that that news events get the proper pictorial coverage.

The news coverage arrangement is perhaps the most unique section of the APS. News assignments are covered by a team of three men consisting of a still man, a movie man, and a caption writer. This caption writer can readily handle either of the other two jobs. Practically all of the men working on these teams have had experience on American newspapers and the majority of the still photographers come from Hollywood studios and other profesional posts. Many of them were trained for their present work at the Army Pictorial Laboratories in Astoria, Long Island.

The still man on the team carries a kit equivalent to that used in civilian life. His basic camera is the 4 x 5 speed graphic, which is as important to him as the rifle is to the infantryman. Included is an *f* 4.5 Ektar 5" lens in a supermatic shutter, with speeds up to 1/1000 part of a second with a focal plane shutter. A Hugo Meyer synchronized range finder, a Mendelsohn or Graflex flash gun complete the camera proper. A film pack adapter is also part of the kit, but it is reserved primarily for emergency use. A Crown tripod, Weston or GE exposure meter, lens hood, and set of four filters complete the outfit.

In view of the constant wear on equipment, a complete repair shop has been installed. It now services work for the Navy and Air Force as well as for the Royal Navy and the British Army.

The movie man has a more complicated array of equipment. A 35 mm Eyemo or Mitchell, with as many of the 1- 2- 4- 6- 10- 12-inch lens as are accessible, form his basic equipment. In addition a heavy tripod, 400-foot magazines, and a 12-volt motor, operated by a twenty-five pound aircraft

SPRAGUE TRADING POST

A FREE Buy-Exchange-Sell Service for Radio Men

FOR SALE OR SWAP—Precision No. 199 modernized analyzer, complete with octal plug and socket, $45. Weston 0-7 volts No. 506 voltmeter, $3. Weston Thermo-ammeter .3 to 1.5 amps. No. 425, $8. Weston No. 528 AC voltmeter 4-8-150 volts, $11. Readrite No. 410 tube tester, $10. Radio City Products No. 205 supermultidapter, $3. Gernsback vol. 6 service manual, new—unbound, $5. Want late model tube checker, condenser analyzer, No. 8 Rider manual, or vac. tube voltmeter. Joseph Marcavage, 8515 253rd St., Bellerose, N. Y.

FOR SALE OR TRADE—One No. 189 Supreme signal generator. Built-in Modulator and audio sig. output. Also Jackson No. 680 dynamic output tube tester and multi-tester comoination. What have you? R. W. Stepanek, 2807 South Ave., Council Bluffs, Iowa.

WANTED—Professional or semi-pro recorder. Must have 2-mike input. Will swap any of following: RCA No. 156 tube tester; Philco 088 batt. signal generator; Superior channel-analyzer; Philco recording arm and train. Cherrill Radio & Television Service, 4235 Barnett St., Philadelphia 35, Pa.

WANT TO TRADE—A battery ranger model 557 signal generator (all bands) for an electric model, or will sell bat. model for cash and buy for cash. A. V. Larsen, Madison, Minn.

WANTED—Second I-F transformer for Majestic model 25 radio. I.F. is 175 kc. and has tapped secondary All replies answered. Frest Radio Service, 811 21st St., East Moline, Ill

FOR SALE—Hallicrafter frequency standard, Type HT-7, 10-100-1000 kc. Good tubes, and in fine condition, $25. Triplett type 321 0-1 ma. 3" meter, scale 100M-0, 0-500, 0-10-50-250-500. 100 ohms internal resistance, $4. One 6AB7 (1853) tube, $1.25. One 6N7 tube, $1. Both metal, and used very little. Wallace M. Kennard, R.D. 2, Wilmington, Dela.

FOR SALE OR TRADE—PR-16 good condition, speaker, Xtal, complete. Make offer. Also Philco all-purpose set tester No. 048, signal generator not hooked up at present, oscillator unit O.K. tester changed from AC to DC operation. Joseph F. Szabat, 120 Clarion St., Oil City, Pa.

FOR SALE—Weston thermo-galvanometer No. 425, 5.2 ohms, 1-115 ma., also 01 meter, Weston. Want a signal generator and Rider's manuals 10-12 and 13. Cash. J. B. Mosley, 1426 North 24th St., Birmingham, Ala.

FOR SALE OR TRADE—Bell No. 570 amplifier, $45. Has some distortion, needs some work. Also have two Shure No. 55 dynamic mikes; one just factory-reconditioned, $27.50; one "as is," $22.50. Want late model oscillator, or tube tester. Ohio Valley Sound Service, 2024 Pennsylvania St., Evansville 12, Ind.

TUBES FOR SALE—5—6AB6; 1—6AD7; 4—6AE5; 2—6B6; 2—6C7S; 1—6E6; 1—6E7; 1—6F7S; 4—6L5; 4—6N5; 1—6S7; 6—6V7; 1—6W5; 5—6Y6; 1—6Y7; 4—6ZY5; 3—6Z7; 3—201A; 2—1A6; 1—F4; 2—1F5; 1—1F6; 2—1G4; 2—1G6; 1—1G5; 2—1J5; 12—2A6; 5—2A7; 2—2B7; 3—3A8; 3—6A3; 2—6A4; 3—6A5; 1—12A; 1—12A5; 2—12A7; 1—12B8; 2—12E5; 1—12F5; 1—12SC7; 4—12SF5; 3—12J7; 1—12Z5; 2—19; 3—22; 4—25AC5; 8—25AC7; 1—25B5; 1—25D8; 3—25N6; 2—25X6; 1—25Y5; 10—31; 16—32; 3—32L7; 7—34; 8—33; 2—40; 3—48; 2—49; 8—55; 1—112A. Genesee Radio Service, G3432 So. Saginaw St., Flint, Mich.

WANTED—Superior meg-O-meter (50,000 ohms to 100 meg.) and Philco or other battery signal generator for cash. Also want 100 ohm and 750 ohm W. W. potentiometers, used or new. F. R. Schroder, R.R. No. 1, Oakdale, Conn.

FOR SALE—Scott Sixteen receiver. Condition fair. New tubes have been installed. 1939 model. Console type. 4 bands. $90 or will swap for a signal generator. Set worth $200. Arthur J. Cherpoff, 86-96 Bay 26th St., Brooklyn, New York.

WANTED—Will pay 25c for one copy of 1942 catalog issued by Midwest Radio Corp. of Cincinnati. Write first. Wilmer H. Jacobson, Stanhope, Iowa.

TUBES FOR SALE—Four 35's; 5—58's; 1—6B7; 1—33; 1—36; 1—42; also 1 old BH tube. Want No. 585 Supreme set and tube tester, also oscillator. C. M. Rebelien, Kiester, Minn.

WANTED FOR CASH—Superior 1230 signal generator and 1280 set-tube tester. H. J. Ackermann, 5077 Genevieve St., St. Louis, Mo.

WANTED—Test eqpt. of all kinds. Have for sale or trade Webster PR60 sound amplifier, or what have you? Walter Keith Radio Service, 137 East 12th St. So., Newton, Iowa.

FOR SALE OR TRADE—Sprague No. 16 Telomike; Weston 772 with 666 socket selector; "Radio Service" neon sign (4" letters). Want good signal generator, cash, or what have you? Samuel Hornick, 8707 Twelfth St., Detroit, Mich.

WANTED—Portable typewriter, also 500 mill. 1250 DC after filter power transformer—or, entire power supply if available. Cash. Sgt. Harold H. Christianson, 219 AA Gn. Bn., Hq. Btry., c/o General Delivery, Paterson, N. J.

WANTED—Precision signal generator series E-200 and a good V-O-M. Walter Stridick, 625 Ferry Ave., Camden, N. J.

FOR SALE—RCP tube tester and set tester; Precision tube tester No. 910 MCP; Astatic hi-fidelity Xtal pickup; RCP free point tester; also various service supplies. Will sell or trade for Stancor auto radio pack No. 133, or Hickok multimeter No. 210S, or will pay cash for same. Jeeve Radio Co Baltic, Ohio.

WANTED—An AC-DC V-O-M of 1000 ohms per volt sensitivity. Must be recent, and of std. make. Give full details and price. E. B. Haffner, Patterson Park High School, Baltimore 24, Md.

TUBES WANTED—Types 1A7; 1H5; 1N5; 1A5; 12SQ7; 12SK7; 6SQ7—especially the 1A7's. G or GT types. Ellison's Radio Service, Centertown, Ky.

WANTED—New or used home recorder or recording mechanism, also photo electric cell. Have stamp collection, or will pay cash. Michael F. Benson, Fort Qu'Appelle, Sask., Canada.

WILL TRADE—Rider's manuals 1 to 4, never used, for 8mm., 16mm. or 35mm. silent projector. Leslie E. Kulberg, Route No. 1, Box 115-K, Washington 19, D. C.

WANTED FOR CASH—One complete Tok Fone recorder unit (recorder—phonograph—P. A. system). Le Swan Radio Service, 204 Green St., Cambridge 39, Mass.

WILL SWAP—Will trade Supreme No. 546 'scope used about 6 hrs., in A-1 condition. Want a No. 562 audolyzer, No. 155 traceometer, or chanalyst in good condition. H. E. Doverspike, Box 136, Summerville, Pa.

FOR SALE—Hallicrafter receiver SX-28, complete with crystal, 10" PM speaker, and an extra set of 15 tubes. A-1 condition. W. O. Brewster, 3101 Main St., Parsons, Kans.

CLOSING OUT—On account of death: tubes, mikes, ear 'phones, recorders, fans, battery charger, and wire, etc. Also table radios. What can you use? Write W. A. Hoberdier, 915 Sixth St. N.W., Canton, Ohio.

FOR SALE—Weston No. 354, 30-0-30 DC amps.; Weston 506 0-7 DC volts; Weston 280 0-15 to 150 v. and 0-1.5 amps.; Jewel 54 0-1 milliamps. DC; Jewell 77 0-300 and 0-6 AC volts; Jewel 74 0-30 AC volts; also AC ampere meters 0-5 and 0-2.5; Triplett No. 1502 tube tester portable or counter oak case, val. $60; and Triplett 1181-E portable lab. in oak case, val. $62.75. Ted Solarz, 3033 S. Pulaski Rd., Chicago 23, Ill.

WILL TRADE—Jackson counter tube tester No. 427. In good condition. Also superior sig. generator No. 1230, little used. Will trade for well-known communication receiver or what have you? Robt. Newman, 1701 Quentin Rd., Brooklyn, N. Y.

WANTED—Good used signal generator and tube tester or comb. sig. generator and set tester, or comb. tube and set tester. Cash. William Brisco, R.F.D. No. 2, Box 34-A, Hollondale, Miss.

FOR SALE—Radio tubes, parts, etc., slightly used. Send for list. J. C. Thimijan, 715 N. 7th St., Lake City, Minn.

WILL SWAP—ICS radio principles $200 course (1941) and cash for any good servicing eqpt. such as chanalyst, audolyzer, or set tester. Ty Lindgren, 274 Dolores St., San Francisco 3, Calif.

SELL OR TRADE—Westinghouse 115 v. DC to 110 v. AC 2-phase current converter unit in metal case, perfect condition. Also 110 v. DC to 110 v. AC phono motor converter, uses a vibrator. Need tubes, test eqpt., Rider's, etc. G. Thoden, R.D. No. 1, Asbury Park, N. J.

FOR SALE—Need a chart for your tube tester? We have them for all makes and models. B. Paine, 1186 Lexington Ave., New York 28, N. Y.

FOR SALE—Weston No. 547 3-meter set analyzer, also Tobe condenser leakage tester. Good condition. Dave's Radio, 1316 42nd St., Brooklyn 19, N. Y.

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for your unused parts and equipment

Going into the Army or Navy? Giving up your service work for a war job? Or, even if you have remained in servicing work and have unused parts and equipment lying around, you can still render a patriotic service by advertising these for sale through the Sprague Trading Post. We'll gladly run your ad free.

Radio equipment of all types is badly needed today—and the Trading Post will help you dispose of it quickly. It is a golden opportunity to do your bit in keeping radios working on the home front and, at the same time, turn unused materials into cash, and avoid the possibility of obsolescence when the war is won and new, up-to-the-minute equipment is again available.

YOUR AD RUN FREE!

Send in your ad today. "Equipment for Sale" and "Equipment Wanted" ads of an emergency nature will receive first attention. Sprague reserves the right to eliminate any ads which do not fit in with the spirit of this special wartime advertising service. Different Trading Post ads appear regularly in Radio Retailing-Today, Radio Service-Dealer, Service, Radio News, and Radio Craft. Please do not specify any certain magazine for your ad. We'll run it in the first available issue that is going to press.

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Here's an ideal set of ¼ inch square drive sockets and attachments for the mechanic who recognizes good wrenches.

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Our experience as the largest manufacturer of small socket wrenches has enabled us to design this set and include the proper sizes of sockets and attachments. Slide one in your pocket and you're all set to tackle any ignition, electrical, radio or refrigerator job.

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Although these are the smallest tools in our family they do a man's size job and will work right along with the others in the famous Walden Worcester line — medium, regular and heavy duty socket wrenches; drop forged open end and box wrenches, and the famous SPINTITE, the wrench that works like a screw driver.



Ask for WALDEN WORCESTER SET 3100A when you want the set illustrated above. Set contains hinged handle with cross bar; Spintite nut driver with plastic handle; five single hex sockets 3/16, 7/32, 1/4, 9/32; three double hex sockets 11/32, 3/8, 7/16; three double square sockets 1/4, 5/16, 3/8; complete in a drawn steel box with partition. Tools and box are protected with the highest quality corrosion resistant finish.

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type battery, complete his working equipment.

A Wac sergeant recently has been added to the Press Room personnel. With the arrival of more and more Wacs in the ETO, it was found convenient to have a Wac photographer to cover their assignments.

Photographers find light conditions in England quite different from those in America. Actinic values usually deceive the cameramen when they first begin work over here. The light is generally much softer. While light meter readings are reliable, the light values may change between the reading and the actual exposure time. Actual experience in the ever-changing light condition, however, has offset the problem. As the photographers gain more experience, their photographs shows continuous improvement.

More than 30,000 pictures are filed at the APS headquarters laboratory. The Training Film Branch maintains a complete library service designed to supply the entire Theater. Approximately 500 titles are on hand for distribution to units throughout the United Kingdom. Where the number of troops warrant, sub-libraries have been established at strategic locations.

In addition to the training films sent over from the States, factual training reports on localized subjects are also prepared by the APS. A typical example is the recently filmed report, "How to Waterproof a Jeep." At the order of the War Department, a film dealing with activities of the Army Nurse Corps in the ETO is now being filmed. A staff of writers prepares the scripts.

The official photo-mail section handles all documents requiring immediate transmittal from the ETO to the United States. This function utilizes both 35 mm and 16 mm Recordak machines, operated by a unit of men especially trained in Washington for the job. The two model D Micro file units, when working at top speed, can process 1600 micro copies of a chart or of documents up to 30 by 50 inches, per hour.

The American Embassy also uses the official photo-mail facilities for classified papers. This operation cuts the time it takes diplomatic pouches to reach Washington. For the official letter-size paper, a Recordak 16 mm unit, duplicating the V-mail process, is used. Capacity is 1500 per hour. The laboratory service completely processes the rolls, and packs them for shipment after the first of the thousand letters have been photographed. Franked correspondence may also be transmitted by this method.

The supply problem is indicated by the fact that more than a quarter of a million prints are processed monthly in the APS laboratory. More than 30,000 feet of movie film are exposed monthly and distributed to British film laboratories for processing. The expendable supplies are to a large extent obtained from the British under Reciprocal Aid. This source is appreciated when adverse shipping conditions otherwise might have greatly curtailed the required quantity coming from the United States.

When the first American Forces landed in the ETO, they arrived without personal cameras, in accordance with Army regulations. Many amateur photographers bought and borrowed cameras from the British, however, and this, together with the subsequent abolition of the restriction against cameras, presented a real problem to Army Intelligence Officers. With only commercial processing available there was considerable opportunity for the right picture to be seen by the wrong person. Consequently, an amateur film section for Army personnel was organized. At present, it is developing more than 9000 prints daily, all of which are censored by the Army Press Censor. Prints that fail to pass censorship are not destroyed but are carefully identified. They will be returned to the owner after the war. Of nearly one million prints already reviewed, less than one percent were not returnable, primarily due to faulty addresses, not to censorship.

The APS in this theater has moved steadily forward from the "kitchen sink and tar-papered windows," to a smooth functioning organization which covers all the diversified activities found in this Theater of war.

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Aviation Radio

(*Continued from page* 209)

in excess of 100 megacycles. The first type of interference can only be corrected by the proper shielding and bonding of certain circuits; such as, the high tension ignition circuits of the engine, electric propellor wiring, and generator circuits wiring. It has been found that a large amount of the shielded conduit on the balance of the wiring of the airplane can be eliminated, provided engineering personnel maintain the over-all shielding and bonding of the airplane in a satisfactory condition.

The elimination of this conduit has resulted in a saving of aluminum at the airplane manufacturer's plant, a saving in man hours, and increased ease of maintenance in the electrical wiring of the airplane.

At this point it might be interesting to have a look into some of our airplanes and see what they use in the way of radio equipment. According to popular misconception each plane is fitted out with one all-purpose radio augmented by an interphone system. Such is not the case. The modern long-range bomber or transport airplane will have a command set, which is operated by the pilot and used for command and navigation purposes; a radio operator's set, which is higher powered and employs both fixed and trailing antenna; the modern automatic radio compass, which is used by the pilot for homing or taking bearings

FEDERAL will LEAD again



FEDERAL pioneered in developing and perfecting enlargers with "expensive" features but without the penalty of high cost. Consequently, more people were enabled to get more fun out of their hobby. America's entrance into the war was the signal that made us abandon the production, but certainly not the contemplation, of even better enlargers.

In the enormous war program ***Federal*** has become an important link in the chain of supply. Twice our efforts have been awarded recognition by the Army and Navy. ***Federal's*** wartime developments in electronics will be reflected in ***Federal's*** peacetime developments in photography... and will prove, once again, ***Federal's*** leadership in the field.

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—Pan American World Airways Photos.



on radio stations on the ground; and equipment used for identification and instrument landing.

One of the most important devices on the airplane is the interphone system. This is essentially a telephone system connecting up the various positions on the airplane so that the pilot, co-pilot, bombardier, navigator, radio operators, and gunners can talk to each other during the flight. The airplane cannot efficiently engage in combat unless information and orders are quickly transmitted between the various combat positions on the plane. The interphone system has recently been modernized by oxygen mask type microphones and new flat response receivers. The interphone system is also used at high altitudes to check on the various members of the crew to determine whether or not each member is getting an adequate supply of oxygen and everything is going well at his position.

Both the pilot and the navigator are able to operate the automatic radio compass. The loop of this compass operates on the null position and causes the pointer of the pilot's indicator to automatically point to the radio station to which the compass is tuned. If the pilot desires to "home" on the position of a known radio station, he merely keeps the needle on zero. The needle swings around to 180 degrees when the station has been passed over. This type of compass is free of the difficulty experienced in 180-degree ambiguity on compasses of the right-left type of indication. Bearings can quickly be taken on radio stations which are to the right or left of the airplane course, the reciprocal of such bearings being employed for plotting purposes on the map. This compass is standard equipment on all of the larger airplanes, such as medium and heavy bombers and transports. A smaller version of the radio compass is also installed on light bombers and fighters.

While it is true that radio devices are used for many purposes in communication and navigation, yet the most important use of airborne radio is still in the field of airplane communications; that is, the transmission of messages between airplanes and between airplanes and ground stations. For this purpose our larger airplanes carry what is known as the command set, which is pilot-operated and the liaison set, which is operated by the radio operator. In addition, all airplanes are now equipped with the so-called VHF set, which is crystal-controlled with push-button operation. There is a strong trend toward simplification and greater use of operation of airborne equipment. Radio operators cannot be expected to carry out complicated tuning procedures under combat conditions and it is highly desirable that all sets either be crystal-controlled or have pre-set frequencies on the ground with air operation by push-button or a similar easy-to-operate type.

All of the larger types of airplanes are also equipped with a marker beacon receiver, which is used on instrument landing and also used to give the pilot a visual indication of position over fan and cone of silence markers when flying along the commercial airlines or along the ATC routes.

There is also a sea rescue set to be used by the crew in the event of "ditching," or as the Navy calls it, "dunking," in the water. Strangely enough, the idea for the development of a sea rescue set was suggested by the discovery of a fundamentally similar set among captured German aircraft radio equipment. The American product, however, developed and perfected, is far superior to the crude equipment which came out of the German plane which had been "clawed" to earth somewhere in England. Technically, the sea rescue set is a hand-powered, emergency transmitter, transmitting a MCW signal on a frequency of 500 kilocycles and designed for operation in a rubber life raft. It provides for automatic or manual transmission of a pre-determined signal upon which the radio compass of searching parties can "home." A signal lamp for night operation can be used by plugging the lamp into a socket on the transmitter case. Under these conditions no radio transmission takes place. The lamp burns steadily unless it is desired to key it manually. A box kite, or balloon inflated with hydrogen gas generated on the spot by means of a chemical generator, whichever is more practical according to the wind velocity, is used to suspend the antenna for this equipment. The set and all its facilities are dropped on the water with a parachute.

Army airplanes fly all over the world in all kinds of weather and under all kinds of climatic conditions and altitudes. Therefore, it is necessary that our airborne radio equipment be thoroughly tested under extremes of humidity, altitude, temperature, and vibration in order to make certain that satisfactory operation will be obtained under all conditions of flight. The radio equipment can and does cause the tactical mission to be successfully completed. It is capable of bringing, and does bring the airplanes and crew back to the airport for a safe landing when other means of navigation have failed. Therefore, it is of the utmost importance that our radio equipment be of the highest quality and reliability and be capable of operation under the most adverse circumstances.

Many radio engineers are looking into the future and making plans for the application of radio aids to commercial flying which have been developed during this war. Certainly all of the flying services will be benefited by the tremendous amount of research which is being carried out on radio aids to air navigation and a great forward step has been taken in the improvement of the over-all safety and efficiency of flying.

—30—



VIBRATION TESTED

Long before the war, TUNG-SOL established the practice of "Vibration-Testing" all radio tubes of new design and tubes picked out at regular intervals from the production line. Making tubes that meet government standards was nothing new.

Today the TUNG-SOL Radio Tubes in communication equipment of jeeps and planes and tanks and in portable sending and receiving sets are subjected to far more severe conditions than will ever be encountered in civilian uses. TUNG-SOL Tubes are giving praiseworthy performances . . . a direct result of "Vibration-Testing."

Manufacturers of electronic devices and of electronically controlled equipment will find TUNG-SOL a most satisfactory source of dependable tubes for every application. TUNG-SOL research engineers will be glad to assist you now in making your post-war products more efficient through Electronics.

Current is introduced through the various circuits of the tube while it is being rapidly vibrated. Uniformity of the current flow is indicated by sensitive meters and is positive proof of proper design and construction. Tubes that pass this most exacting test are truly classed as "VIBRATION-TESTED."



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vibration-tested
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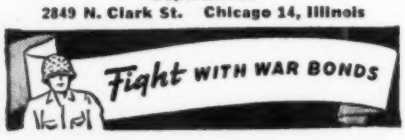
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Wire to Tokyo

(*Continued from page* 201)

Aurora Borealis; second, because of a high ground potential. The number of channels desired exceeded the number of frequencies available and, in any case, radio offered less security.

Construction of the first link of the wire system, 442 miles from Edmonton, Alberta, to Dawson Creek, British Columbia, was begun by a private contractor who soon ran into difficulty. The Signal Corps had promised that the link, to tie in with regular facilities at Helena, Montana, would be completed by December 1, 1942, the date of the highway's formal opening.

The contractor notified the Army Communications Service that it would be impossible to meet the deadline; that December 16 was the earliest he could guarantee to establish the circuits. One obstacle, a critical copper shortage, had been surmounted by engineers who made it possible to use copperweld wire, composed of only 30 per cent copper, but the reduction of conductivity made it necessary to use repeater stations every 95 miles instead of the usual 200-mile interval.

It was the third week of November. Only five miles of circuit had been placed and 93 miles of poles remained to be set.

Regardless of the handicaps, Brigadier General Frank E. Stoner, Chief of the Army Communications Service, decided the job would be finished on time.

So the Army Communications Service swung into action. How it accomplished that "impossible" feat is one of the most dramatic highlights of the entire project. An "Army Com" representative sped to the scene and began devising time savers. Rush orders were placed with the Western Electric Company which, with the co-operation of Bell Laboratories, produced in 26 days the telephone carrier and repeater apparatus that normally would have required 26 weeks to manufacture, assemble, and ship. Tons of the equipment were flown across the continent by Army Transport planes.

Things began to hum in the field, too. One hundred forty Signal Construction men were sent in as reinforcements to five wire line groups obtained from the Bell Telephone Company of Canada and other line gangs from the American Telephone and Telegraph Company.

Not even the region's worst blizzard in forty years prevented the Army Communications Service from making the deadline.

Working from dawn to midnight in the bitter sub-Arctic cold, the men laid wire and cross-arms on the ground at night, erected poles the next morning after blasting holes in the frozen soil. Fighting against time, they improvised expedients as they went along. They placed cross-arms on every second pole instead of every pole. They hung 150 miles of wire on nails driven in telegraph poles where regular pole setting couldn't be completed. They installed repeaters in prefabricated wooden Yakatat huts.

Storm-blocked roads hampered transportation, but still the line went through.

It was not until November 22, after completion of the arrangements, that actual work began. Just eight days later the line was finished over a distance comparable to that between Washington and Boston.

At 7:50 p.m., December 1, General Stoner picked up his telephone in Washington and talked with Col. Heath Twitchell of the Corps of Engineers in Dawson Creek.

The job that couldn't be done had been done.

That, however, was only the start. For months thereafter the Army Communications Service continued its work of extending the permanent line from Dawson Creek to Whitehorse—900 miles — and finally from Whitehorse to Fairbanks, 633 miles farther.

While the pole line is the core of the system, the communications are not confined to telephone, telegraph, and teletype. At each repeater installation along the way is a radio station for use as a backstop in the event of wire failures. There, also, unusual problems such as interference from the northern lights and freezing of radio parts have been met.

An enormous amount of electronic research and engineering lies behind the success of the wire line. Two physical pairs of conductors are utilized directly and indirectly for the provision of more than a dozen channels. The heart of the complex organism is the C-5 carrier system, without which the same number of channels would have required a far bulkier and more expensive cable.

Bell System engineers played a major role in solving problems of attenuation and of different losses at different frequencies within any given band.

The speed of the project is a direct tribute to the staff of the Army Communications Service: Colonel Fred P. Andrews of the Alaska Communications Service; Colonel Will V. Parker, Director of the Plant Engineering Agency; Colonel Carl H. Hatch, Executive Officer, Army Communications Service; Lt. Colonel Ora F. Roberts, outside construction foreman and Captain Hugh C. Harris of the Plant Engineering Agency. The problems of supply and transportation were in themselves tremendous. Involved in these operations were the Plant Engineering Agency — another component of the Army Communications Service — the Transportation Corps, the American and Canadian railroads and ship lines, Army and civilian trucking organizations, Army Air Forces and commercial airlines, the Philadelphia Signal Depot and Procurement District, Inspection Zones of Newark, Philadelphia, Dayton, and Chicago, and numerous contractors.



TO EXACTING LABORATORY STANDARDS..

Over the long period of years separating the past from the present, ECA has been called upon to tackle the development and production of innumerable types of specialized radio and electronic equipment. Consequently, our facilities are geared to exacting laboratory standards. We can handle the most delicate assignments with understanding care and painstaking skill.

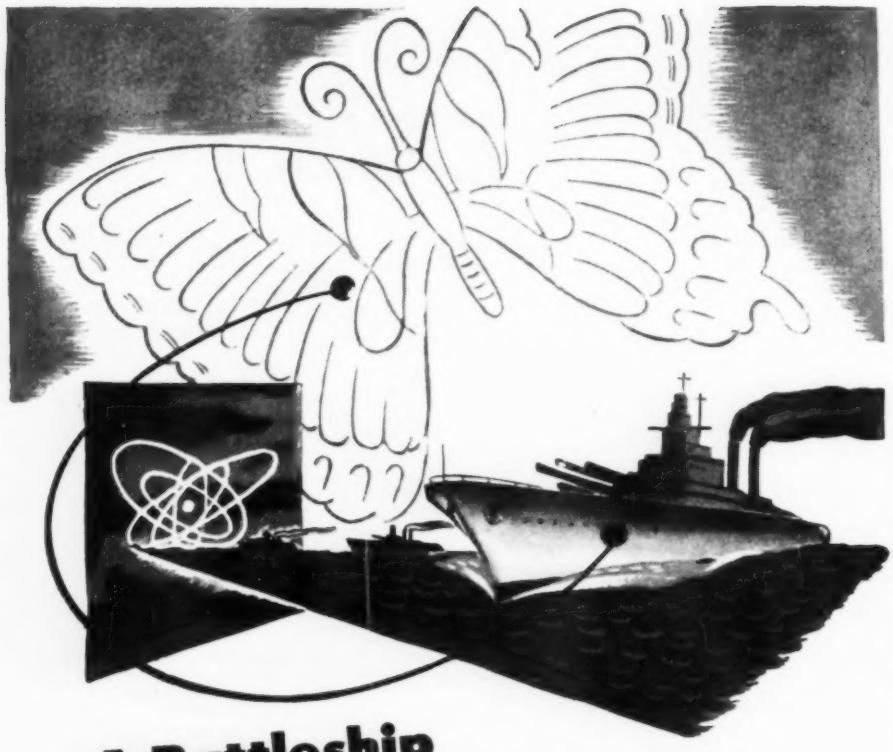
Typical of the apparatus produced by ECA is this Rectifier Power Unit for general laboratory operation. Operating from a 105-125 volt, 50-60 cycle line, it delivers a maximum of 150 ma at 300 volts DC and has an open circuit voltage of 450 volts DC and 45 watts power output from 6.3 volts AC centertapped terminals. The hum voltage is 0.1% at 150 ma for all voltages above 150 volts. Continuous panel control of the DC output voltage is provided through a variable autotransformer.

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A Battleship and a Butterfly's Wing

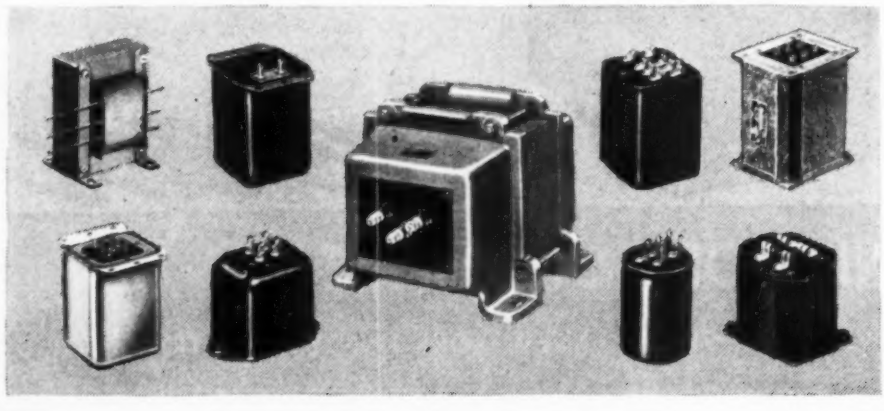
Perhaps the most amazing fact about the new electronic controls is that, with impulses lighter than the flip of a butterfly's wing, they can coordinate a mechanism as complex and massive as a battleship. It is the new combination of supersensitive control and immense energy that opens the way to a postwar age of industrial miracles.

Stancor transformers are now being built to regulate electronic energy for control systems used in war; but Stancor engineers are burning the midnight oil to think ahead to peace-time problems of industrial control. When victory dawns they will have a full quota of practical developments to contribute to the problems of industry.

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The Army Communications Service's work is far from finished—for operation, maintenance, and improvement of the line will continue indefinitely—but it was with pardonable pride that "Army Com" greeted on November 20, 1943, this terse memorandum:

"Headquarters of the Northwest Service Command, Whitehorse, Yukon Territory, has announced today to the Canadian and U. S. Press at Edmonton, Alberta, the completion of the final link—from Whitehorse to Fairbanks and Anchorage in Alaska—in the first overland telephone line connecting the United States with Alaska."

—30—

Radiosonde

(*Continued from page* 207)

to a receiving station on the ground, where the signals are recorded graphically on a moving strip chart.

Trained observers decipher the record for the forecaster who, armed with up-to-the-second information on pressure, temperature, and humidity, is able to time a mission to take advantage of the exact type of weather.

The intriguing little radiosonde, packed in a plastic-covered case, is about the size of a shoe box and weighs less than two and one-half pounds. The hydrogen-filled balloon ultimately bursts in the intensely cold thin air of the stratosphere and a parachute brings the instrument back to earth, where many are recovered.

The carefully selected blonde hairs in the hygrometer element of the radiosonde expand or contract in proportion to the relative humidity of the air. Blonde hair is preferred over other varieties because it is thinner and absorbs moisture faster and only the hairs which have not been subjected to permanent waving are used, since heating tends to kill the life of the hair.

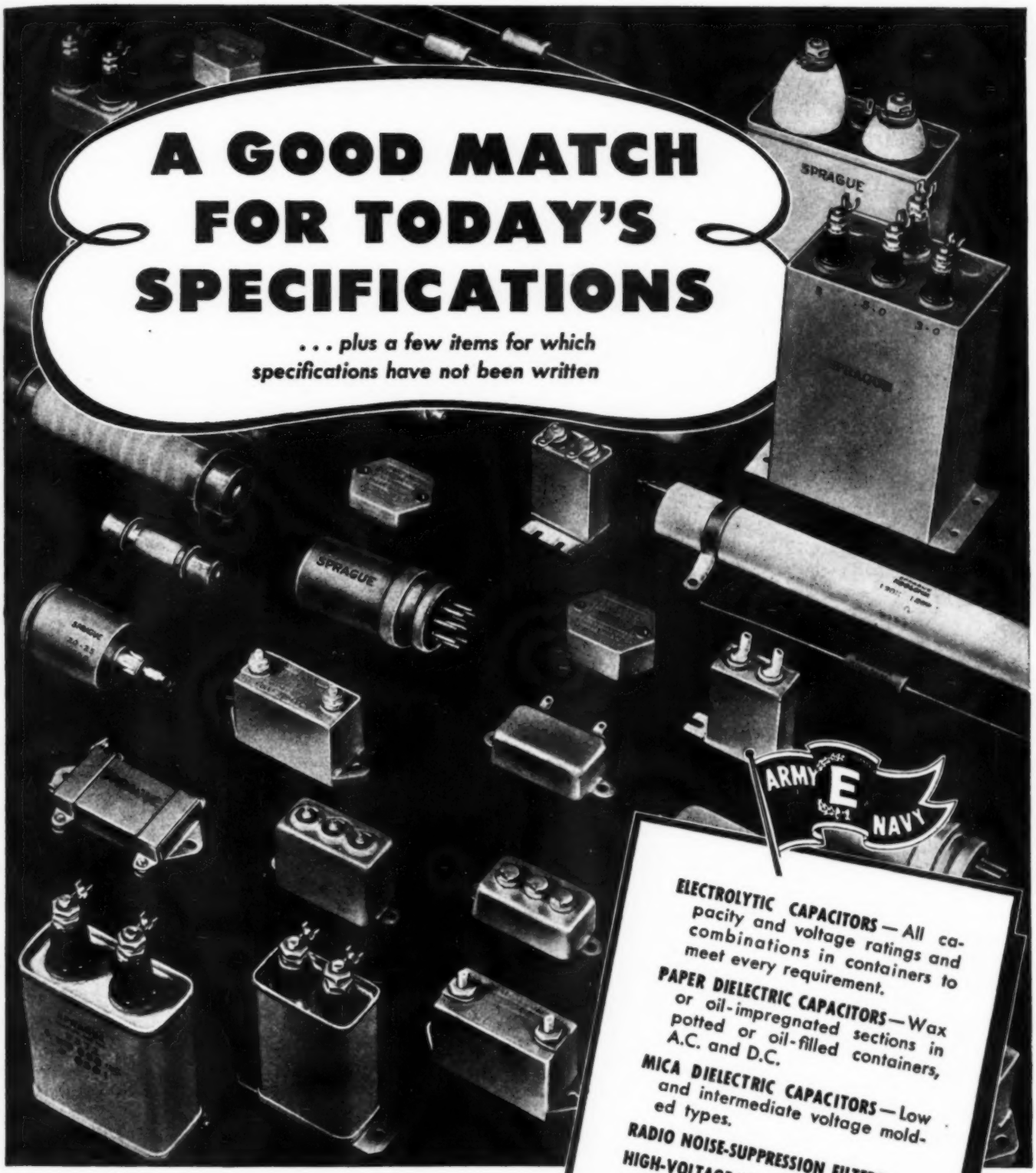
A V-shaped glass tube, filled with a mixture of hydrochloric acid and alcohol whose resistance varies with the temperature, is radiosonde's thermometer. The pressure element is an evacuated bellows which expands or contracts in accordance with the pressure of the air.

The elements are connected across a commutator and tied in with a transmitter which broadcasts a continuous signal at a frequency of 72.2 megacycles. Tone pitches vary with the changing humidity, temperature, and pressure, so a complete running record of each may be charted on the ground.

Sometimes called the Diamond-Hinman radiosonde in honor of the two scientists largely responsible for the device, it was principally developed by the Bureau of Standards.

Signal Corps laboratories have done considerable work toward improvement, however, and two or three other types are under development.

—30—



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Army Photographers

(*Continued from page* 128)

During this period, the men are given brush-up courses in basic military training, such as first aid, the care and use of military equipment, gas mask, and close order drills.

It must be remembered that the men in basic will ultimately be combat photographers. They are soldiers and will be among the first to land on enemy shores. For 22 hours, the students are taught map reading. Since photographers usually go out on assignments alone or in small groups, it is imperative for them to be able to read maps, follow trails, and read a compass. To this end, the students are given field problems. They actually go out to training areas with maps and compasses and they are required to orientate themselves, find a trail, and follow it to a given destination.

Into this brief space of two weeks, time is found to teach the men Army organization and military courtesy. An Army photographer must be an all around soldier. He must know the fundamental principles and have a knowledge of every branch of Service for he travels, works, and fights with every arm of the Service.

Last, but not least, comes training in basic photography. Students are taught the mechanics, the care, and use of every type of camera used by the Army. In every emergency, an Army photographer comes through because he has at least a working knowledge of all the photographic equipment which can possibly come his way. Besides the speed camera, these men are given general lectures on all types of 35 mm cameras. This phase includes also motion picture cameras: the 35 mm and the 16 mm. There are lectures on lenses, filters, and basic optics.

During these two weeks, the emphasis is on general photography. There is little emphasis on detail or theory. At the conclusion of this course, and on the basis of the soldier's civilian record and talents, together with the results of an interview by two or more officers of the Training Division, each man is assigned for the remaining ten weeks to a specialized group.

There are three fields of specialized study, to which students may be assigned for further training. They are (1) the still school, (2) the darkroom or laboratory, (3) the motion picture school. After the basic class has been segregated into these three groups, students spend four weeks more in basic training in their particular field and then they are given six weeks advanced instruction.

During the next four weeks of basic instruction, the stress is on the practical side. The students are given problems with all types of cameras, including the miniatures. These problems are supervised and are designed to give



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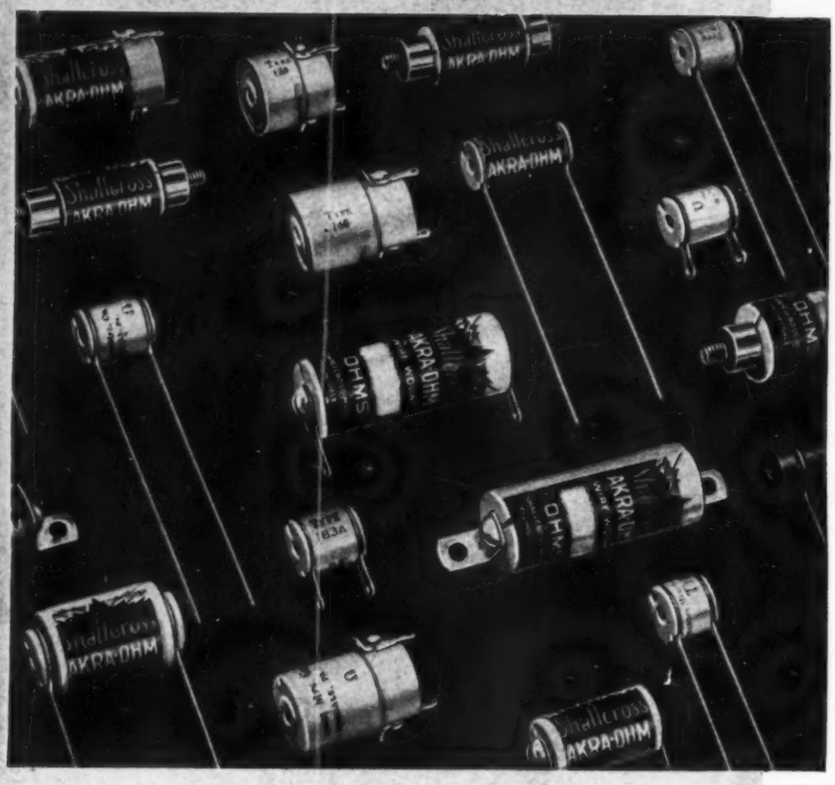
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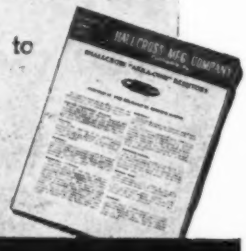
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the students practice in the use of the various cameras and techniques. The assignments during this phase are intended to teach students correct exposure without the use of an exposure meter; to teach them to judge distance for focus and to teach speed in handling camera equipment—these obviously being important considerations for photographers in combat areas. Other assignments are planned to demonstrate the speed necessary to stop moving objects and the use of a camera over obstacle courses; also, the use of various types of lenses, including telephoto and wide angle.

During the latter part of this period the pictures are criticized for news and story value and for pictorial continuity. This brings the class up to a final assignment which includes a rough scenario, written by the cameraman. A story is built around a key picture and a series of supporting pictures which include variety in the picture angle, over-all shots to show story setting, detail shots, activity, portraits.

Along with training in photography, the students during these four weeks continue their military training. Their photography assignments are planned so that they will be required to build hasty fortifications after long marches and to make overnight bivouac. The Signal Corps photographers carry weapons at all times. Most commonly used by the men in photographic companies, are the carbine, the 45 calibre automatic, and the Thompson sub-machine gun.

During this course, the men are given preliminary training in the building and use of the field laboratory and in the care and operation of equipment under extreme or inclement weather conditions. Tropical temperature and high temperature processing and printing, although they sound alike, present two distinct problems. In tropical weather conditions, the temperature range is usually from 80° to 95° F. but the humidity is always over 70 per cent and at times from 95 per cent to 100 per cent; the latter during storms and hurricane weather. High temperatures, usually encountered in the desert, range from 75° to 135° F., but the air is relatively dry. This distinction is made early in the course and detailed instructions are given with regard to processing and printing under each condition.

At the other end, there are the problems presented in temperatures encountered during the winter and in Arctic and Antarctic regions. A pamphlet has been prepared outlining the information available on the subject, including chemistry, procedure, and general recommendations for low temperature processing.

Fortified with all these instructions, the students in the still school are then ready for the final six weeks of advanced training. In general, it might be considered just a continuation of the previous four weeks with an intensified program. The officer instructors of this phase are former newspa-

(*Continued on page* 301)





The "UNOBTAINABLE" MATERIALS

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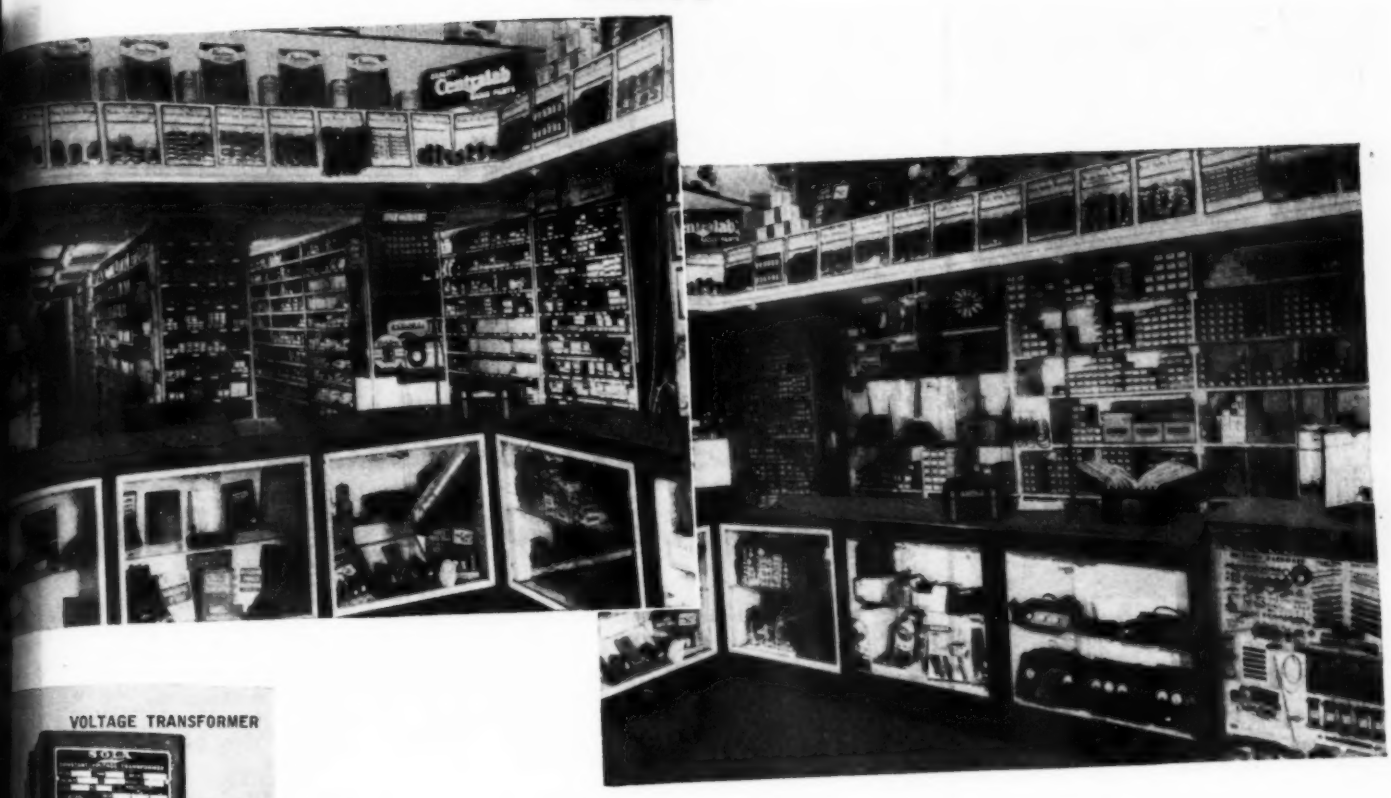
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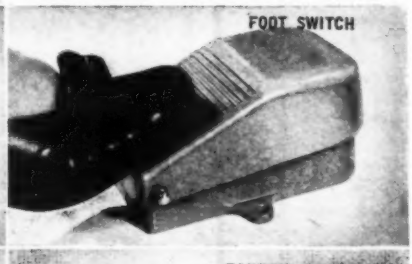
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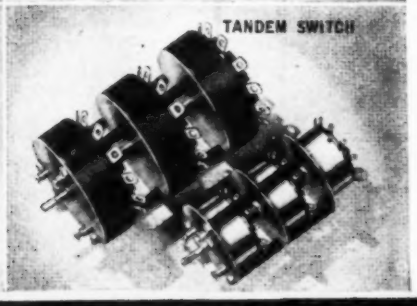












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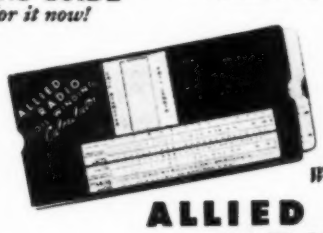
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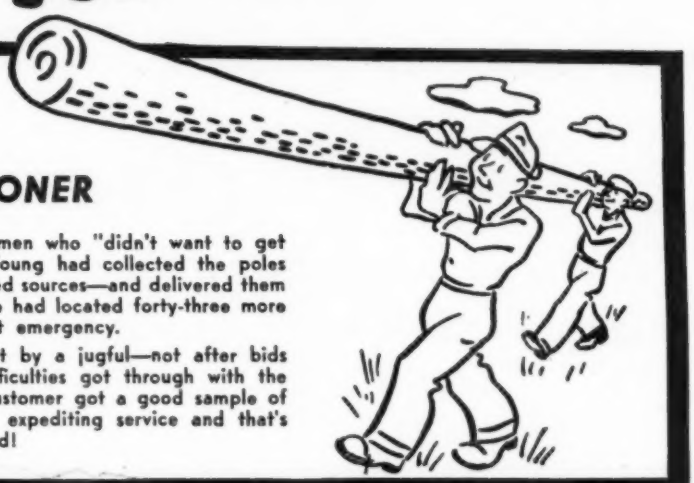
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Need RCA Tubes for any Radio or Electronic application? Need RCA Test Equipment? Need capacitors, resistors, relays, solenoids, rheostats, potentiometers, coils, transformers—or the products of any one of dozens of manufacturers? Then try our service today. We know the Radio-Electronic field. We know who makes the products you need and how they can be obtained. Our personalized service costs nothing extra—and has long since proved its value to busy manufacturers.

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Founded in 1919, Cameradio has been dealing with things Electronic since the "knee pants" days of Radio itself.

Our stocks are large—our lines cover practically any industrial Electronic requirement — and we're geared for the prompt, accurate, technically-informed service that busy war equipment manufacturers, laboratories, and governmental agencies demand.

Next time you need any of the equipment or components produced by manufacturers on the accompanying list—TRY CAMERADIO FIRST.

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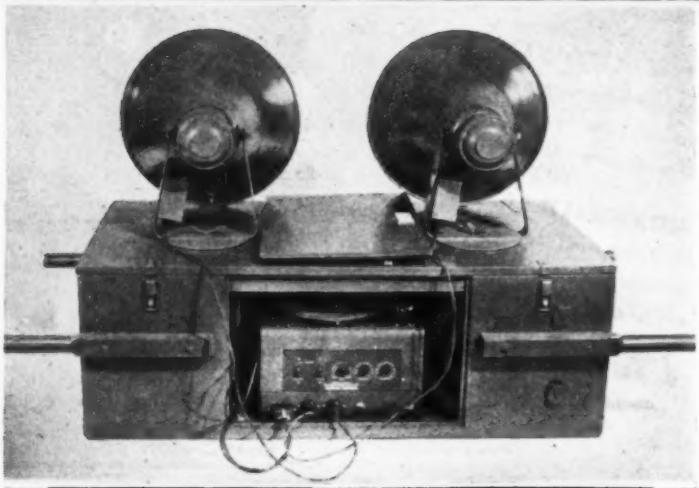
85 Cortlandt St., New York 7, N. Y.
Phone: WOrth 2-4415

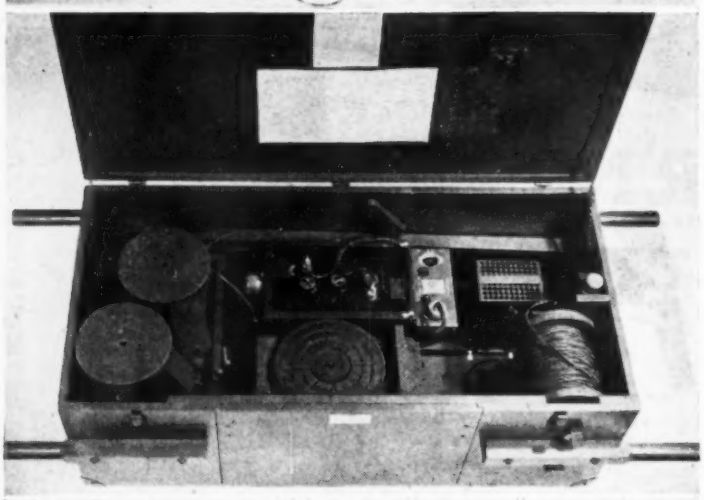
TUBES AND RCA **EQUIPMENT**

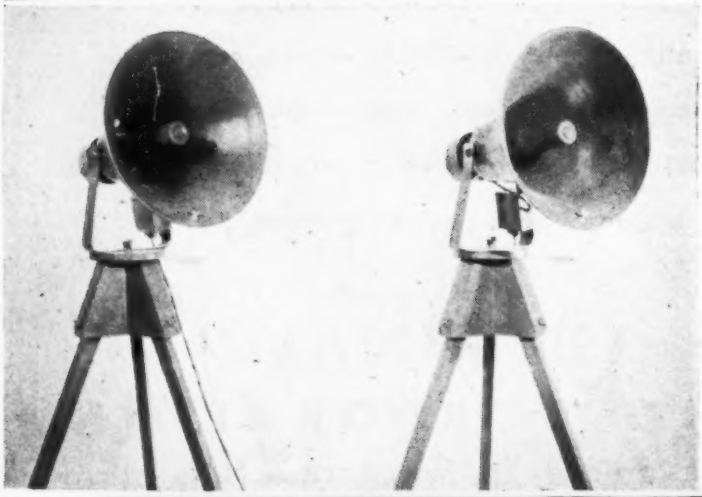
SERVICE ON RADIO-ELECTRONIC MATERIALS RCA

CAMBRIDGE, WASHINGTON

THIS RCA VICTOR DISTRIBU







● On December 7, 1941, The Eastern Company was engaged in the wholesale distribution of RCA Victor phonographs, radios, tubes, RCA commercial sound equipment, Victor and Bluebird records, RCA and numerous other makes of electronic parts and equipment. A large volume of business was also done in refrigerators, ranges, washers, vacuum cleaners and other major appliances. Since then The Eastern Company has gone to war as illustrated on these pages. Today 80% of this company's business is directly supporting the war effort.

● Pictured on this page is Public Address Set PA-5 being currently manufactured for the Signal Corps. This unique equipment is a multi-purpose, portable public address system designed for operation on storage battery or a.c. current with two loudspeakers mounted on one of the carrying chests or on stands which may be set up 200 feet from the amplifier. Microphone or phonograph record sound may be broadcast singly or in combination. A built in battery charger provides for keeping the equipment at top efficiency. All of this equipment plus a complete set of spare parts and spare battery is compactly stored in three chests equipped with carrying handles. It is easy to foresee wide peace time usage for apparatus of this design.

RCA The EASTERN Company

RCA 'ROUND-THE-CORNER SERVICE FOR BUSY WA

PROVIDENCE, WORCESTER

UTOR HAS GONE TO WAR!

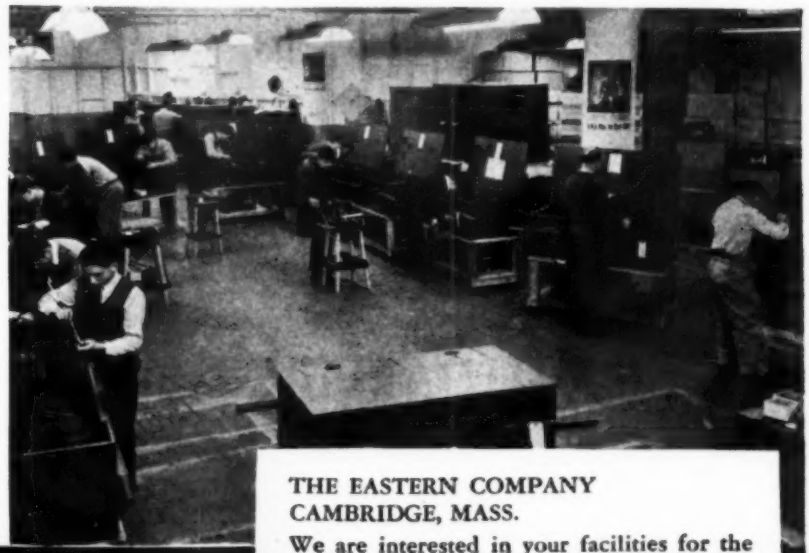
● At the right is pictured a section of one of the floors of the former warehouse of The Eastern Company now converted into a fine daylight factory overlooking the historic Charles river. Phonograph record music is provided for the workers in this and other sections of the plant by an RCA Victor sound distribution system. Work in process here is cable assembly for vitally important electronic apparatus and other sub contract work for one of the largest electronic manufacturers. These facilities are constantly being expanded in size.





● Above is shown that section of the plant engaged in the assembly and test of Public Address System PA-5 described on the opposite page. Completion of this important contract will occupy these facilities for several months. In all of the activities as shown, the company is acquiring rich and varied engineering and manufacturing skill with which to attack further war needs and peace time electronic business.

● Below is illustrated a section of the plant devoted to the manufacture of Talk-Back Public Address Systems for the U. S. Navy. Many hundreds of these systems have been built for use in the many theatres of war throughout the world. Equipment of this type will also find wide adaptation to industrial uses in the post war world.



THE EASTERN COMPANY
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We are interested in your facilities for the production of electronic equipment as a prime or sub contractor. Please have a representative call on us.

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Here is your "Open Sesame!" to rapid, intelligent expediting on your orders for almost any type of Radio or Radio-Electronic material. Chances are good that we can ship your order from stock upon receipt of proper priorities. If not, we know *where* the materials can be obtained, *how* they can be obtained, and how they can be shipped to you far more promptly than you may have thought possible under existing war-time emergency conditions. "Electronics" is nothing new to us. Try our service on your next order—small or large!

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Remember: The "Magic Brain" of any Electronic Device is a vacuum tube and the fountainhead of modern tube development is RCA. We are headquarters for RCA Tubes for all applications; also RCA Test Equipment, as well as resistors, rheostats, relays, capacitors, transformers, wire, coils, and the products of many different manufacturers.

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SAVE TIME—AVOID TROUBLE

It pays to buy specialized Electronic items from long-time specialists in this field!

Our experience is broad—our stocks normally large—our service prompt—and our technically-informed staff geared for just the type of service busy Electronic equipment users require.

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Headquarters for Accurate, Informed Service on

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- Relays (Solenoids)
- and countless other components, produced by many manufacturers

Making war equipment that necessitates frequent calls for Radio-Electronic tubes and other Electronic components? Then get acquainted with our service—today!

Chances are, we've got what you need in stock—for immediate delivery upon receipt of suitable priorities. If not, we're well equipped to get it for you faster than you can obtain it from any other source—and to render intelligent, personalized expediting service all along the line. Try us on your next order and be convinced!

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FIVE FORKS BATTERY STATION

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RCA THESE EMERGENCY ELECTRONIC EXPEDITER



Today, two years after Pearl Harbor

. . . Many of our boys are gone.

. . . Midnight oil is being burned by the barrel.

. . . Yankee ingenuity is being worked overtime.

. . . Our stocks are not as large as they used to be.

. . . Often, we've got to search all over the map for some small but necessary part that, yesterday, was only an arm's length away.

. . . And it's not unusual to be asked to furnish something entirely out of our line—or maybe something we've never heard of before. . . .

BUT . . . *THE ORDERS ARE FILLED . . . AND FILLED ON TIME!*

Meanwhile, we're not kidding ourselves or indulging in self-pity because we have to work twice as hard as we've ever worked before. It's our job—the very least we can do—and we mean this sincerely when we say it. To deliver the goods on time; to be courteous, helpful, and genuinely efficient will, we hope, in some small way, repay our debt to our nation and those who fight its battles.

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227 Asylum Street • Hartford 3, Connecticut

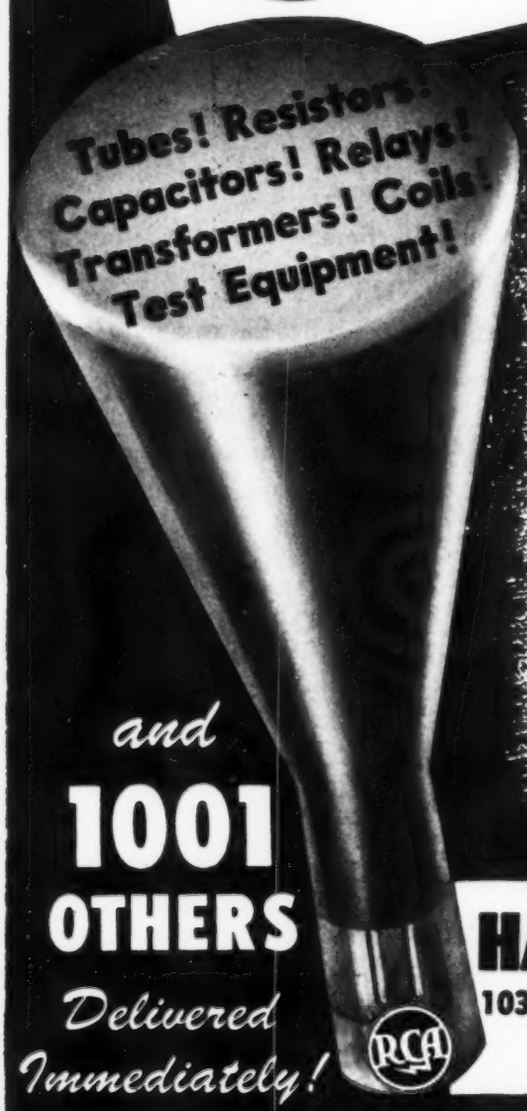
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For large and small quantities from stock . . . or for hard-to-find components and equipment, HARVEY is a constant, dependable source of supply. This is our 18th year of service — buying, selling, representing and warehousing stock from America's leading manufacturers. Orders are filled quickly and efficiently. Components that we may not have at the moment are promptly traced by a staff trained to find them. If you need technical advice or have priority problems, our experts are at your instant command. In short, we are here to see to it that you get the best . . . and the best qualified . . . for your money.

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The proof of the pudding is in the service that we can render. If you need radio and electronic components, make it a point to contact HARVEY first.

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RCA *THESE DISTRIBUTORS KNOW WHAT*

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LAFAYETTE RADIO CORP.

IS AS CLOSE TO YOU AS



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Working hand-in-hand with

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and other fine manufacturers, and aided by a seasoned technical and expediting staff, we maintain two complete organizations, strategically located in Chicago and Atlanta. Here, we cut through red tape . . . assist you with priority problems . . . give you the help of our consultant radio technicians and engineers. And, every piece of equipment comes to you with our ironclad guarantee of satisfaction.

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Free! The Newest and Only Up-to-Date Radio and Electronic Catalog Available Today Newest listings of radio and electronic parts and equipment; latest developments in inter-communications apparatus; greatly expanded listing of tools, especially for factory use; an invaluable volume for all engaged in vital war and civilian work.



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10TH AND WALNUT STREETS, ST. LOUIS

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RADIO-ELECTRONIC MATERIAL

PUBLIC ADDRESS SYSTEMS
MICROPHONES RCA TUBES
LOUD SPEAKERS TRANSFORMERS
RELAYS RESISTORS CONTROLS

Replacement Parts for All Makes of Radio

● We carry normally large stocks for immediate delivery upon receipt of suitable priority. On items not in stock we usually know of a source of supply and therefore can be of considerable assistance to you in procuring vitally needed equipment. Our engineers have had many years of experience and are equipped to render invaluable advice, if you wish.

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ON ALL ELECTRONIC LINES

INTERSTATE SUPPLY COMPANY

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DALE E. NEISWANDER, General Manager

RCA-VICTOR DISTRIBUTOR

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YOUR ORDERS FOR ELECTRONIC MATERIALS

These are days when it pays doubly to send your orders for Radio-Electronic materials to a long-time specialist. We know the field. We know what is available. We know where it can be obtained—faster than you may have thought possible under existing wartime emergency conditions.



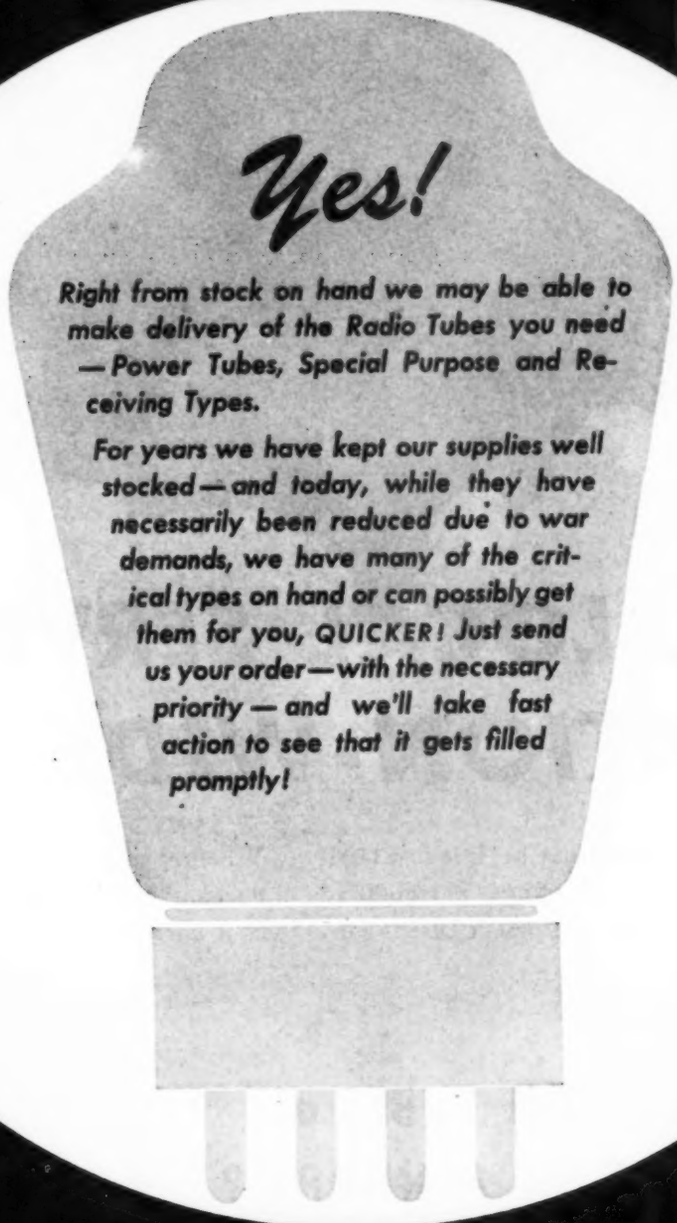
RCA Tubes, RCA Test Equipment—or resistors, rheostats, controls, potentiometers, capacitors, relays, transformers, wire—or numerous other products produced by many manufacturers. They're our business. We know how to deliver the goods. Try us on your next order!

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Grace at 14th St.
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Phone 3-1946

TUBES AND RCA EQUIPMENT

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IF IT'S TUBES YOU NEED
Chances are We Have Them!



Yes!

Right from stock on hand we may be able to make delivery of the Radio Tubes you need — Power Tubes, Special Purpose and Receiving Types.

For years we have kept our supplies well stocked — and today, while they have necessarily been reduced due to war demands, we have many of the critical types on hand or can possibly get them for you, QUICKER! Just send us your order — with the necessary priority — and we'll take fast action to see that it gets filled promptly!

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No matter where your plant may be, it is in a territory that is served on a close-range, personalized basis by an RCA Tube and Equipment Distributor.

Whether your need be for one Electronic item or a dozen, this Distributor is geared to help you select it correctly—then get it faster than you may have thought possible under wartime conditions. He knows Electronic equipment technically. He knows the Electronic markets. Above all, he knows how to deliver the kind of service that busy war equipment manufacturers require.

Let him serve as your specialized expediter in this fast-growing field!

RCA VICTOR DIVISION, CAMDEN, N. J.

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RADIO CORPORATION OF AMERICA

(*Continued from page 272*)

permen with from 10 to 20 years' experience on the metropolitan papers.

Each student starts out on this final lap with a complete speed camera outfit which has been assigned to him for the duration of the course and a personal locker for his equipment. The students, who by this time are considered trained combat photographers, work from an assignment desk organized along the same lines as the assignment desk of any newspaper.

The field assignments given to these students are chiefly but not exclusively of a military nature. They go within a 30-50 mile radius from the Center in Long Island City and include the "shooting" of Officers at various public functions, military parades, all types of maneuvers, and pyrotechnic exhibits at nearby towns, the latter giving the students practice in night photography. On request of the Training Division the students are sent to cover pictorial stories in such restricted areas as ports of embarkation, Halloran General Hospital, and scenes of air accidents. And twice a week, these men are sent to the Tank School at Eastview, N. Y., where they learn to work with and from tanks through hazards and obstacles. It is during these assignments that the students begin to apply their classroom knowledge of continuity and the value of story-telling pictures.

The aim of this part of the training program is not only to give the students practice in photography but to simulate battle problems and conditions. Thus, after arriving at a given destination, usually a wooded or suburban section, the men are taken on a nine-mile hike through streams and swamps, learning to protect the camera from water, shrubbery and entangling foliage, learning camouflage. On these hikes and under these conditions, they take pictures, remembering all they have previously learned regarding range, speed, exposure, and composition.

On these trips, the men are taught how to set up a portable laboratory unit. They erect a canvas tent and make it light-proof, in order to use it as a darkroom. Water is secured from nearby streams. The main object of a portable laboratory is speed and the men are required to make a photographic print from a wet negative and to deliver the wet print in 15 minutes.

Another very important phase of this study is the negative critique class held twice a week for the entire section. Each negative is projected on a screen and criticized by the instructor. The strong and weak points of each negative are brought to the attention of the class.

Each student in the still school is also required to know laboratory technique, so although these students are mainly photographers rather than technicians, they receive darkroom training along with everything else.

Weekly, all the instructors mark the

INTEGRITY OF DESIGN

. . . a phrase that tells the story of a business

The phrase, *Integrity of Design*, has come to typify that "lengthened shadow" behind the business of creating Jackson Instruments. Like Topsy, it "just growed" into our thinking and into our work. Today it constitutes our inspiration—and our constant challenge, permeating every phase of anything we do.

The very *naturalness* of this phrase, as applied to Jackson Instruments, has kept forcing itself forward—until *Integrity of Design* has become the hallmark of Jackson Instruments. It represents that unseen *plus* that comes from "hidden" care. It means that Jackson products are conceived, designed, developed and built—not for low price—but for *high performance.*

And that is why on all fronts Jackson Instruments are measuring up to the demanding tests of war. It is why, too, in the peacetime "tomorrow" to come they will emerge better than ever—from having had to meet the tests of today's raging world conflict.

Let's keep shooting all we can into War Bonds. There's nothing more vital that we on the Home Front can do.

JACKSON

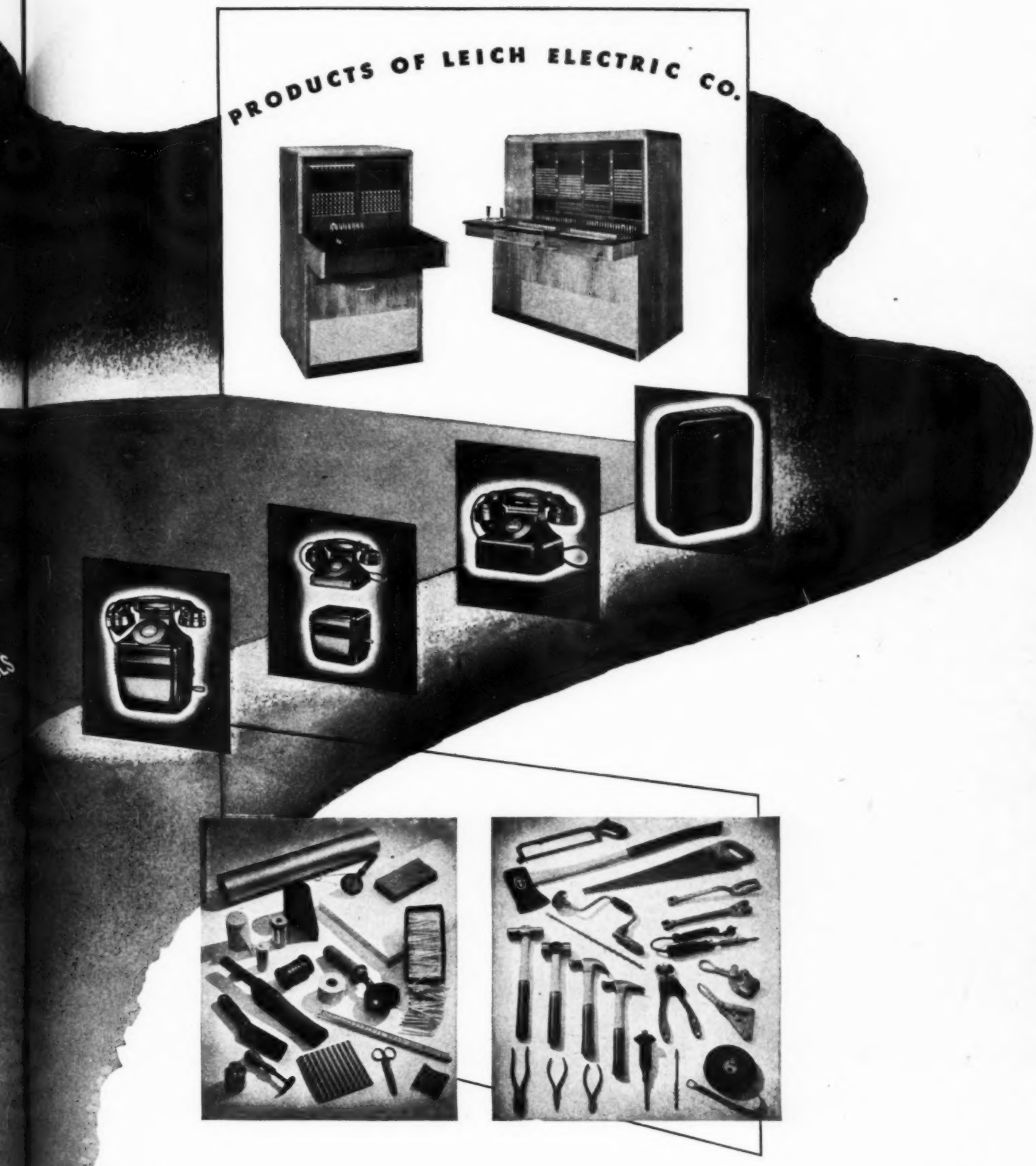
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JACKSON ELECTRICAL INSTRUMENT COMPANY, DAYTON, OHIO



CENTRAL OFFICE SWITCHBOARDS ★ FLOOR TYPE &
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CONVENTIONAL TELEPHONES & GENERATOR BOXES ★
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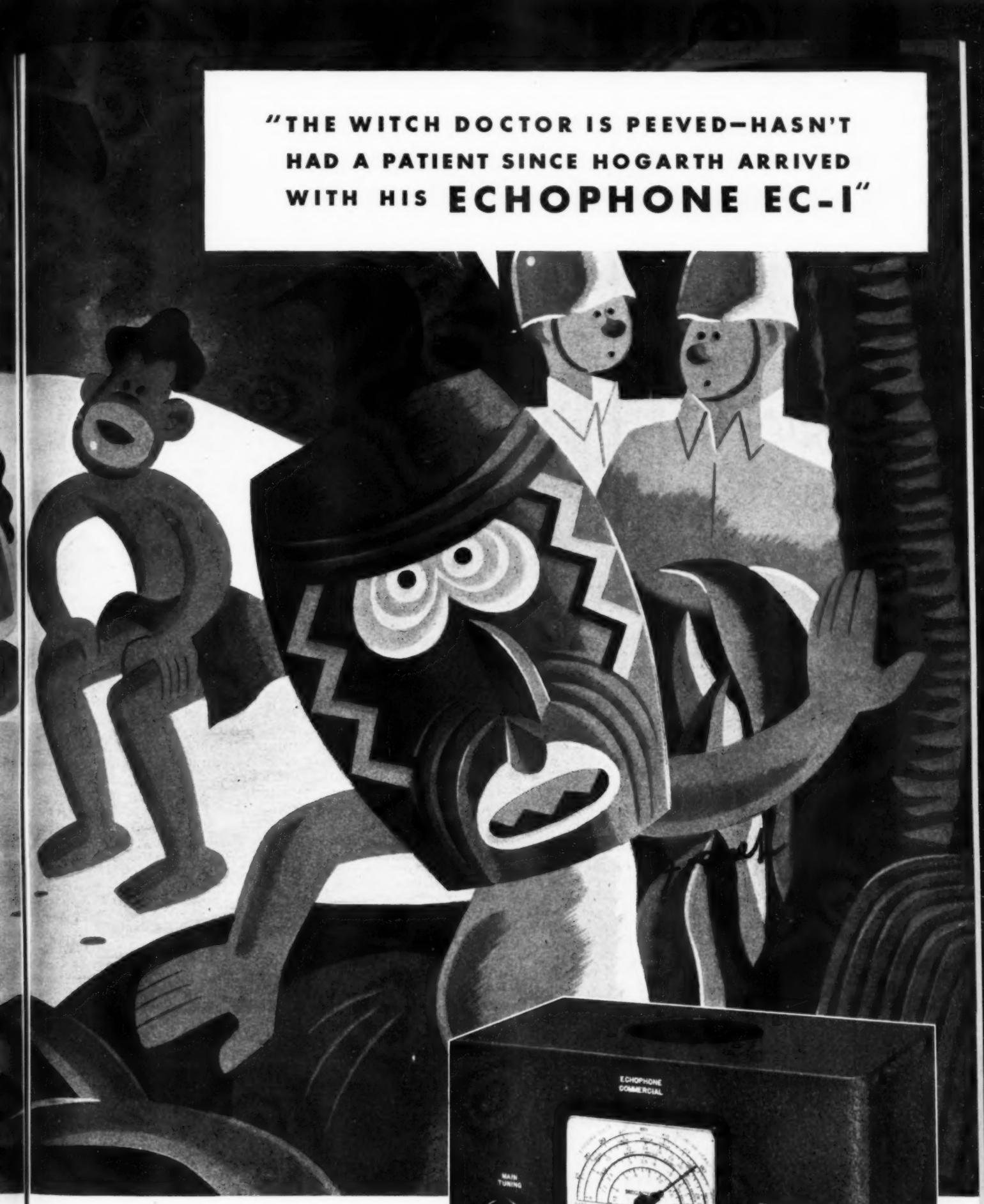
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(Illustrated) a compact communications receiver with every necessary feature for good reception. Covers from 550 kc. to 30 mc. on three bands. Electrical band-spread on all bands. Beat frequency oscillator. Six tubes. Self-contained speaker. Operates on AC or DC.

"THE WITCH DOCTOR IS PEEVED—HASN'T HAD A PATIENT SINCE HOGARTH ARRIVED WITH HIS **ECHOPHONE EC-1**"

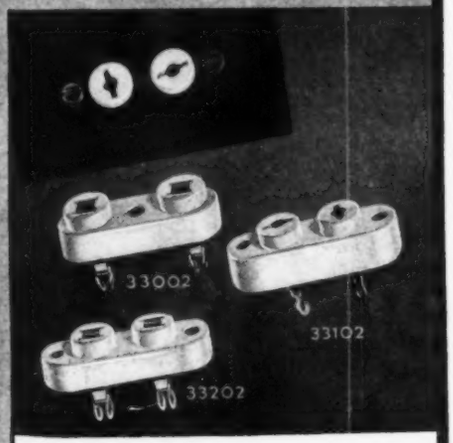




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33102.....	.095	.500
33202.....	.125	.500

JAMES MILLEN MFG. CO., INC.

MAIN OFFICE AND FACTORY
MALDEN
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negatives taken during the week by the students on field assignments. This enables the school to keep a complete record of the photographer's work during his training period. All the negatives are then filed under the student's name with the name of the project, instructor and grade.

At the end of each week, a "Picture of the Week" is chosen from the week's crop and conspicuously posted on the bulletin board together with the name of the photographer and the exposure used. This coveted honor carries not only intangible prestige but a half day off for the happy soldier.

When the students have completed their 12-week training period in the still school, they are available for assignment as photographers (1) with mobile Army units in the field; (2) to training film production units; (3) special photographic units.

Although all the men in the photographic school receive basic training in developing and printing, some are selected after the first two weeks to specialize in the laboratory end of photography and are, therefore, given a ten week course in laboratory work. The emphasis here is, of course, developing, contact printing, and enlarging. The students are taught to make photographic and photostatic copies of maps, text matter, charts, and photographs. They are taught to run identification cameras and to develop the 100-foot rolls of motion picture film used in these cameras. They are taught to retouch negatives. They study photographic chemistry and the various uses and preparations used in photography. These students, too, are given field training. They are sent into the field to set up portable laboratory units where they are required to work under difficult weather conditions. Another phase of their training is developing and processing under extreme weather conditions. They are required to print in temperatures as high as 130° and as low as 35°.

Into the third field of specialization, the motion picture school, is sent a group of carefully selected students for the remaining ten weeks.

As has been said previously, all the students in the school receive the same basic training for the first two weeks. The students who are selected for the motion picture specialization spend the third week in orientation and lectures on the fundamentals of pictorial continuity and on the mechanics, operations, and maintenance of the cameras used by the Army.

This takes them into the fourth week and the beginning of actual shooting. For the first three days the students are given cameras but no film. Under the supervision of an instructor, they do what is called in Army parlance, dry shooting. The students concentrate on planning and the sequence of long shots, medium shots, and close-ups. They practice handling the camera and equipment quickly under pressure and unusual conditions. The following three days, although the instructor remains with the class and the scenes are the same simple set-ups, the cameras are loaded.

During the fifth week the students are given simple, controlled stories to photograph under supervision, a controlled story being one in which the action may be repeated if necessary. All the films shot during these assignments are screened and criticized by the instructor who points out to the class the strong and weak points in the picture and then grades it.

The following week, the assignments remain on the same simple, controlled level but the students work without supervision from the assignment desk. The assignment desk of the school is organized and runs like the desk of any commercial newsreel company or the assignment desk of a metropolitan newspaper.

For the first three days of the seventh week the students are again given a series of lectures. This time on 16-mm photography and the use of kodachrome. The latter part of the week is spent in putting into practice the material presented previously in lectures. The assignments are more difficult, either harder controlled stories or easy uncontrolled stories.

At this point the students are grouped into crews consisting of four enlisted men with an officer in charge. The officer facilitates the handling of assignments and arrangements. He does not shoot or direct. After he tells the cameramen what is expected of them, they go ahead with the assignment which is later screened, criticized, and graded. During this time each student is required to execute entirely on his own an individual assignment, the first of a series of three. Each man handles the entire assignment, making the contact, determining the time and shooting schedule, the amount of film required and the size of the crew.

The ninth week begins with the turning in of the second individual assignment. The men remain in the same crews and continue to work from the assignment desk. The crews are sent to cover real news stories, the same that are covered by the commercial newsreels and many others. During this week the students begin to cut and to edit their own films. This phase of the training is designed to give the cameramen a working knowledge of the mechanics involved in the operation of cutting and splicing machines. This experience gives them a greater appreciation of the problems that confront the cutters and editors and brings to the attention of the cameramen the importance of covering a story completely and thoroughly.

At the beginning of the tenth week new crews are formed. The object of changing the personnel of the crews is to prevent a group from becoming so accustomed to each other that it would be difficult for the individual members to work with other crews. The crews continue to report to the assignment desk for the day's schedule. The desk



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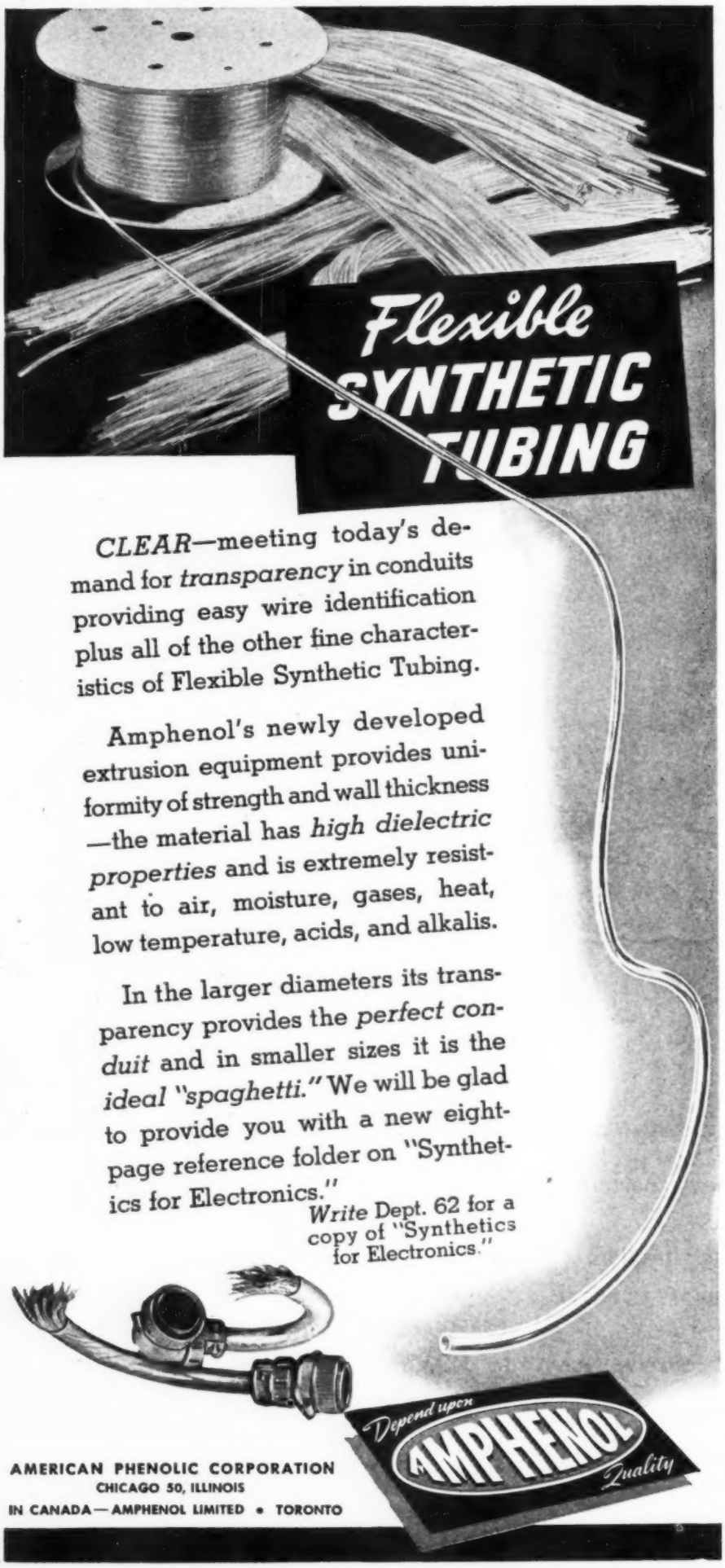
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endeavors to send the advanced crews out on military assignments, such as stories in Mitchell Field and the various camps and forts in and about the New York area. When the military objectives have been exhausted then the assignment desk sends crews to cover civilian activities. The students are given complete instructions as to deportment when dealing with civilian groups and individuals and as to forbidden subjects and subject matter. The students during this period continue to edit and cut their own film which is screened, criticized and graded. They also turn in the third and final individual assignment for screening and grading. For the last two weeks of the course, the students continue with the same routine but the crews are constantly changed.

During the entire course of study the students are required, twice a week, to attend showings of the newsreels made by the 5 major commercial companies. Once a week the entire school, both still and motion picture, is addressed by a war correspondent just returned from overseas duty. At this lecture the students are permitted to ask questions and have a round-table discussion.

At the end of the course, the students are given a five-day furlough and when they return they are ready for assignment to photographic units or companies going on overseas duty.

From time to time, officers and enlisted men of Army Photographic Companies, who have not been through the mill at the Photographic Center, are assigned to Astoria for special technical training. The course is much the same as described above. Upon completion of this training, the men are returned to their companies, where their field training continues.

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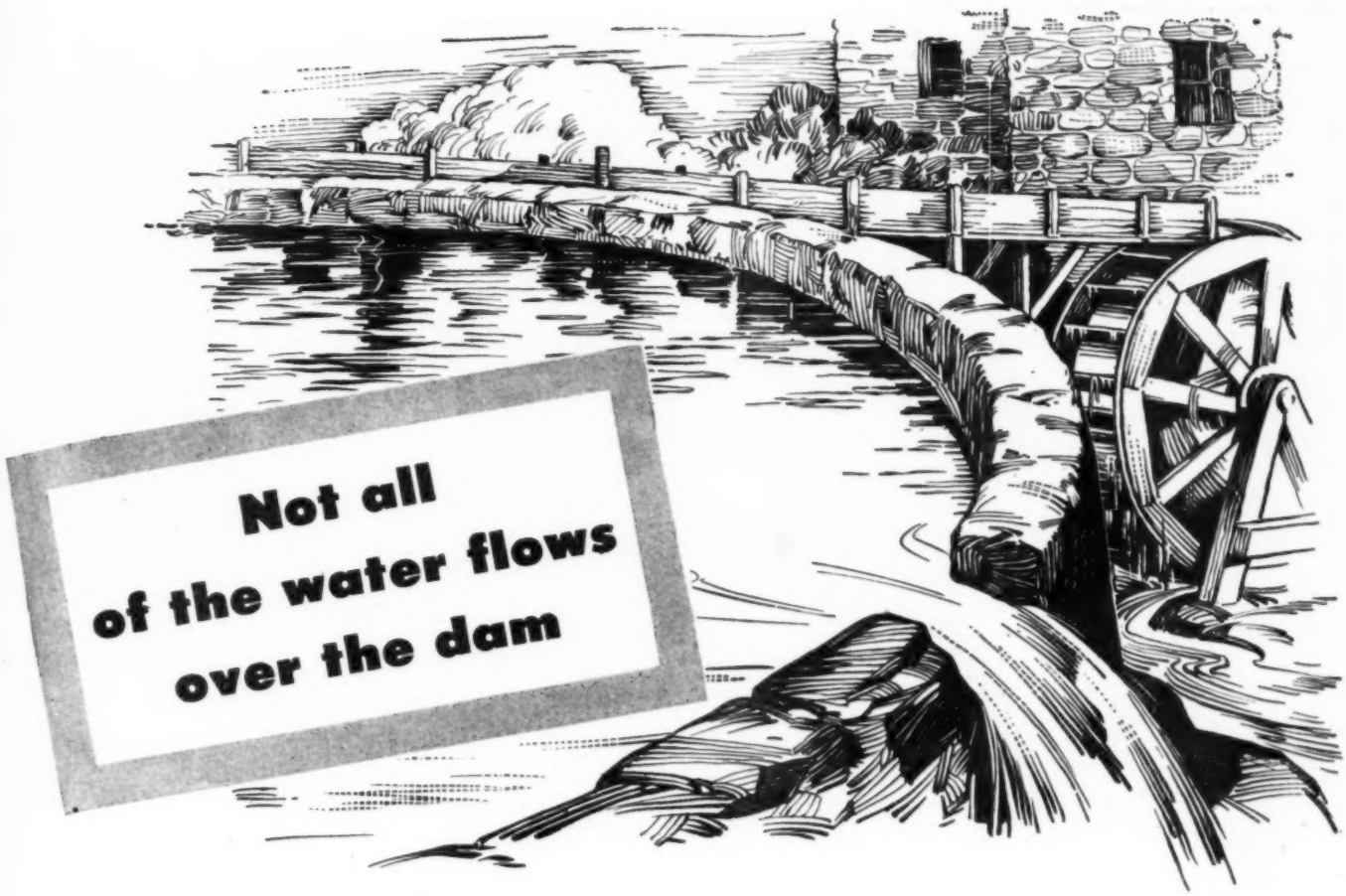
Alaskan Theater
(*Continued from page* 156)

to take care of themselves." So it was that a Rodgers-trained team accompanying the task force to Attu knew how to take care of itself.

Back in Alaska proper the Signal Corps, through its Alaska Communications System, was meeting new and primitive problems in extending communication lines through storms, subzero weather, and over almost impassable terrain.

In one place a telephone line had to be strung from Portage to Whittier, a mere eight miles. Between the two points, however, was a mountain glacier over which it seemed virtually impossible to transport heavy reels of wire.

Again Signal Corps ingenuity met the challenge. Ten reels of twisted-pair telephone wire was loaded in an Army bomber. With its bomb bay doors open, the plane flew low over the glacier, aiming each reel at one of the stakes lining the route in deep snow. A line crew then struggled out



BEFORE it becomes just "water over the dam", every working hour, every problem solved, contributes in some measure to the reservoir of practical knowledge we call experience.

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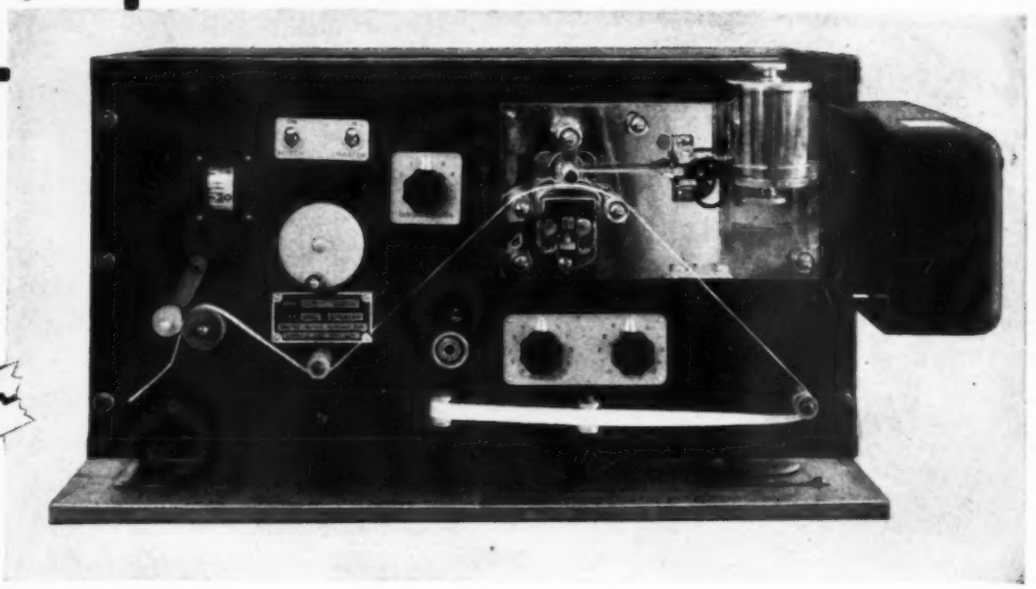
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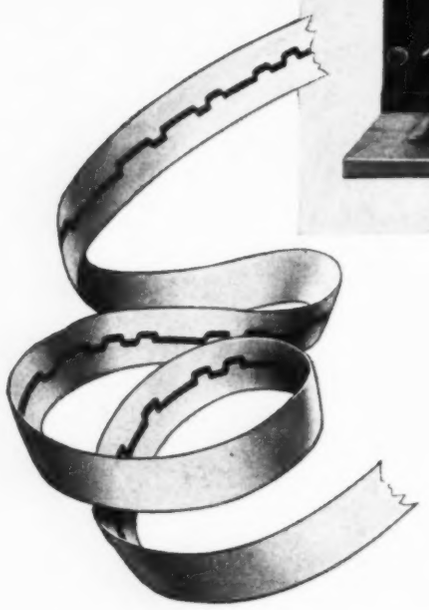


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These recorders are now in production for the Army.

Have you an idea or invention in electro-mechanics

which you think will aid the war effort, or which has peacetime application? We'll be glad to develop it with you on a mutually satisfactory basis.

We are planning to add 5 or 6 products to our post-war line. If you have a product or idea which you believe would fit in with our activities, write Mr. W. E. Ditmars, our President, in complete detail. We will consider any practical arrangement.



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onto the glacier and strung the wire. Even so, it was no easy task; shortly after the line was completed, a workman froze to death trying to cross that same glacier.

Every area presented a new situation. Telephone and telegraph construction gangs battled drenching rains and hordes of fierce mosquitoes during the summer of 1942 to rehabilitate a line from Anchorage to Fairbanks and to string new lines from Anchorage to Portage and Whittier. The job still wasn't complete when winter came, so the men pushed on through blizzards and temperatures that ranged from forty to sixty degrees below zero.

Digging holes for antenna or telephone poles in the frozen ground was often like scratching at concrete. Picks and shovels hardly dented the surface, so Alaska Communications System engineers hit upon the idea of using compressed-air jackhammers. After drilling below the surface, the workmen drove a perforated iron pipe into the ground, forced steam into the pipe to thaw the ground, and then enlarged the hole with picks and shovels.

In many sections telephone poles wouldn't stay in the ground. The annual thaw and freeze would push up a pole six inches to a foot every year, until it eventually sagged and fell, wrecking the line. To lick this problem, three holes were set as a tripod, tripling the construction work but avoiding the difficult task of maintenance in poorly accessible tundra and muskeg.

Windfalls, landslides, and devil-club —a vicious bush with hard stickers— hampered the climbing of mountains to install radio stations. Often engineers had to dismantle the equipment and reassemble it at the top.

The land of Aurora Borealis, famous for freak weather disturbances, played tricks, too, with radio transmission and equipment. The intense cold slowed the chemical activity of batteries and affected the intricate mechanism of radio sets. With adjustments and improvements, however, the equipment won high praise for its performance—a direct tribute to the advance research and planning for sub-Arctic operations.

Behind all of this is the story of a tremendous expansion by the Alaska Communications System, whose personnel mushroomed from 320 to more than 3,000 in two years. It involved a huge job of procurement and of training radio and teletype operators, technicians, and construction teams.

"There are never enough men or equipment on the frontier," said Col. Harry L. Vitzthum after an Alaskan tour. "One headquarters station had to expand four times, handling nearly 200,000 messages a month." Down in Alaska Communications System headquarters at Seattle, the problem was even more acute. There the personnel turned over completely—except for two men—thirty times in ten months.

The greatest over-all difficulties were created by the sheer distances involved; not many persons realize that from Alaska's southernmost island to its Arctic tip, is as far as from the Rio Grande to Canada.

Already, however, Alaska Communications System-engineered equipment guides planes and gives them voice, warns coastal batteries of the approach of hostile forces, links commands of tactical units—and has shrunk the vastness of Alaska and Northwest Canada to the distance between your home and the corner drugstore.

—30—

Army Pictorial

(*Continued from page* 147)

Service Headquarters at the rate of approximately 5,000 a month, are distributed throughout the armed services to bring home, as no amount of words ever could, the lessons of fighting that may be used to shorten the war.

During the first week of the Sicilian campaign, The Still Picture Library Section received 3,400 pictures. In this section the pictures are sorted for the various, interested departments; those for release to the public are selected; all of them are studied for improvements and suggestions on photographic technique, and finally, an extensive filing system is maintained.

Filed pictures are cross-indexed by subject matter, location, personalities, campaigns, and serial numbers, so that at any time in the future they are ready for instant reference.

For the Tunisian campaign, Army Pictorial Service sent over a specially trained "commando outfit" of eight photographers who penetrated to the heart of virtually every battle.

Perhaps the most remarkable part of the photographing of the Sicilian campaign was the fact that pictures of the initial landings of the American troops were being studied in Washington the afternoon of the day they were made. They reached the Capital seven minutes after they left Africa!

This is the accomplishment of Signal Corps Radiophoto. Radiophoto installations are being set up by the Signal Corps all over the world to speed the transmission of vital pictures. They virtually enable the high command at Washington to "see" a battle while it is in progress. The public, too, shares in the advantage of this achievement. Some of those pictures of the Sicilian landings appeared in American newspapers within hours of the actual happening. From the radiophoto machines at headquarters, pictures are distributed to the newspicture services to be telephotoed to every part of the country.

Not only black and white, but color photography is employed by APS photographers wherever pictures in natural colors would be of advantage, such as in the study of camouflage.

In addition to the teams in the thea-



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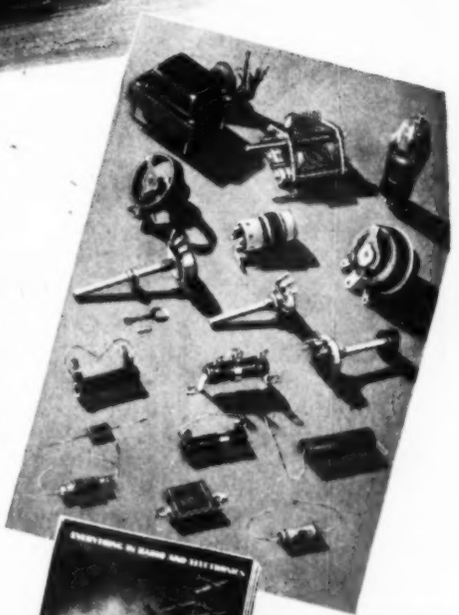
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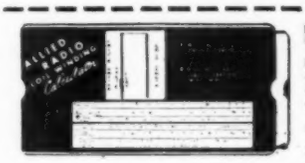
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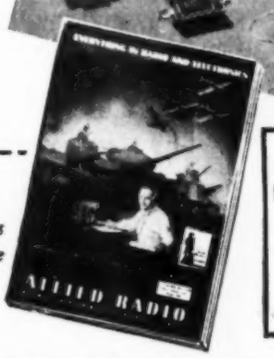
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ters of operation, Army Pictorial Service maintains laboratories all over the United States and photographic teams are dispatched to any point at which there may be call. As an example, two units of motion and still picture photographers "covered" the Quebec conference of President Roosevelt and Prime Minister Churchill in August, 1943.

Many more men are also in training under a continuous program of expansion and replacement that has its headquarters at the Signal Corps Photographic Center, Long Island City, L.I. While soldiers in the Army Pictorial Service are specially selected for previous training, the work of the service requires much training of an ultra-specialized nature. Besides, it is obvious from the work of the photographers at the front that they also need combat training of a high order.

Thus far, however, we have described only a minor portion of the work of Army Pictorial Service today, colorful as that portion may be. Still a major function of the Service is the Photographic Production Branch, with its Production Control Section.

The biggest job of the Production Branch has been the making of training films, a program that was begun in the last war and has reached such a point of development in this one that it has become almost indispensable to the Army's training system. The Production Branch makes two-thirds of all the Army's training films, which includes all confidential pictures and all those requiring extreme supervision. Where civilian actors or expensive sets, scenes, and equipment are required, contracts are made with commercial producers through the Hollywood Branch of the service. On such jobs, the APS assigns one of its own officers as unit manager and one or more technical advisors from whatever arm or service is concerned in the making of the picture.

Film strips and slides are also used extensively in the training programs for projection on screens to illustrate lectures, and at this writing the Production Branch is in the midst of making 3,000,000 slides to teach airplane, tank, and ship identification to our troops. Without these, the job of teaching our soldiers to recognize our own and enemy planes, ships, and tanks would be practically impossible.

In using these slides, the Air Force has a device for gradually speeding up their projection until finally the students are able to recognize a plane after a projection of one-fiftieth of a second, barely long enough for the image to register on the eye. Often in combat, as planes flash past each other, this is as much of a glimpse as these men will get for making a life and death decision.

Film libraries for training purposes are maintained in every service command in the United States and every theater of operations abroad, with sub-libraries in every post and station.

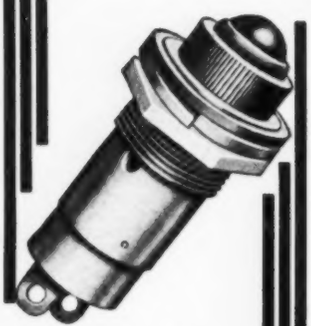
As much training film is now being produced monthly as in the entire pre-war era. But as the Army reaches its full, war-time strength, the training film program begins to taper off. At the same time, U. S. Army activities become more highly co-ordinated with those of the other United Nations and the Production Branch has undertaken the fast-growing job of rescoring our training films in other languages for their use. This branch also adopts the films of other nations, and of the Navy and Marine Corps, to the uses of U. S. Army troops.

What has proved an extremely useful function of the Production Branch is the making and issuance of film bulletins which are in reality short training films on new equipment and methods to keep the entire Army abreast of new developments. This branch also produces a "screen magazine" which is shown for morale and educational purposes on the same bill with Hollywood features for off-duty soldiers in posts and stations. Much of the screen magazine material is in the lighter vein, such as the adventures of Private Snafu, who illustrates for the soldiers the wrong way of doing things.

The films produced for the Industrial Services Branch of the Army Bureau of Public Relations, to speed up production by showing workers how their products are being used in the Army, have met with immense success.

The Signal Corps, Army Special Services Division, and Hollywood studios, are collaborating in the making of the famous "Why We Fight" series

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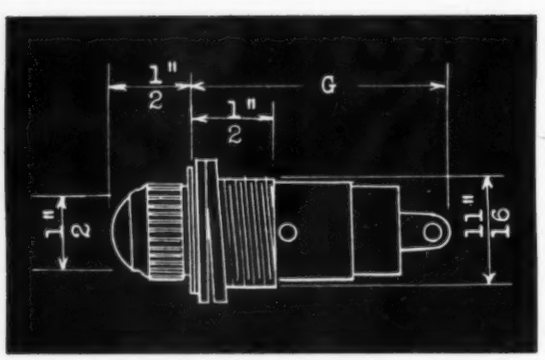
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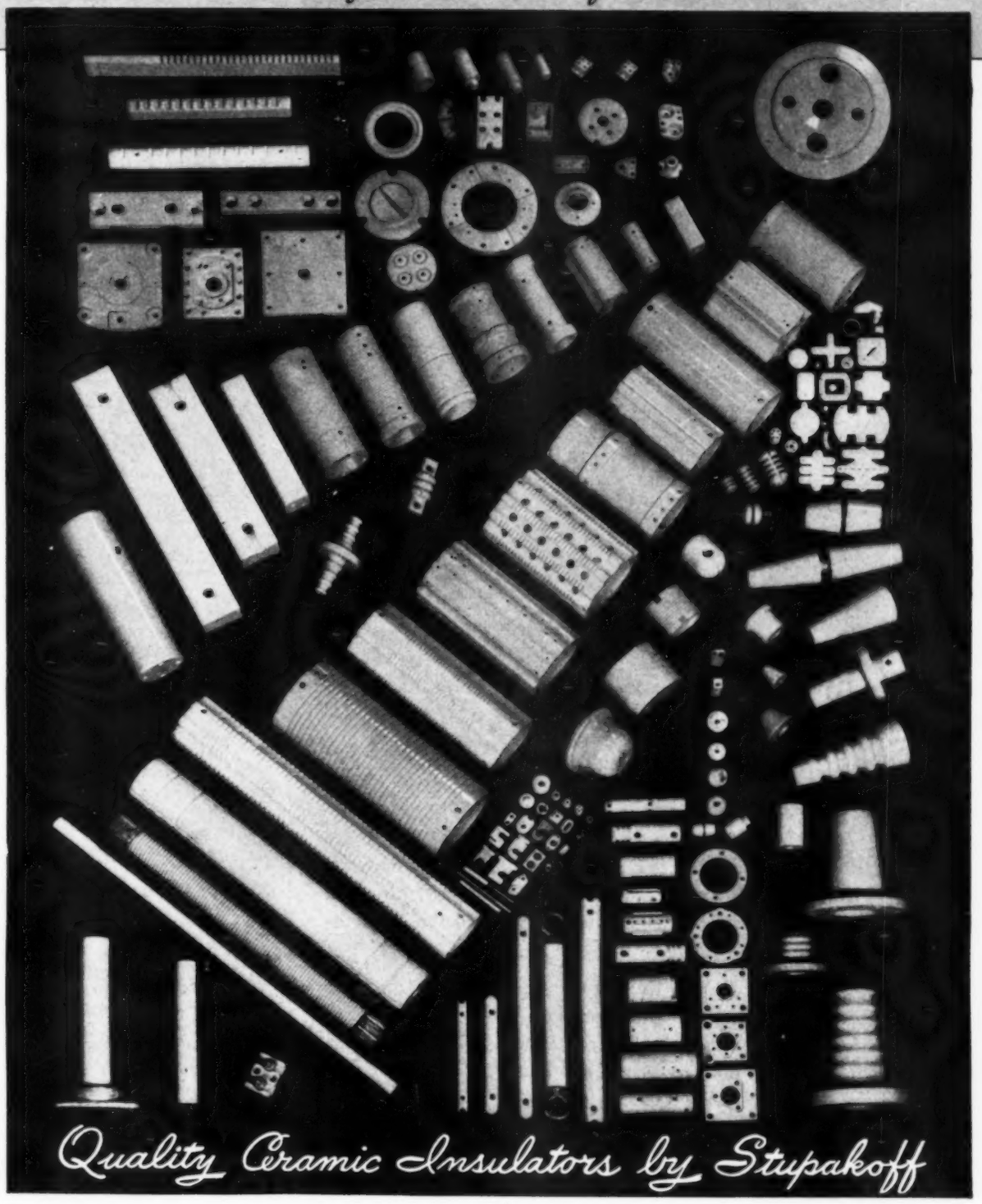
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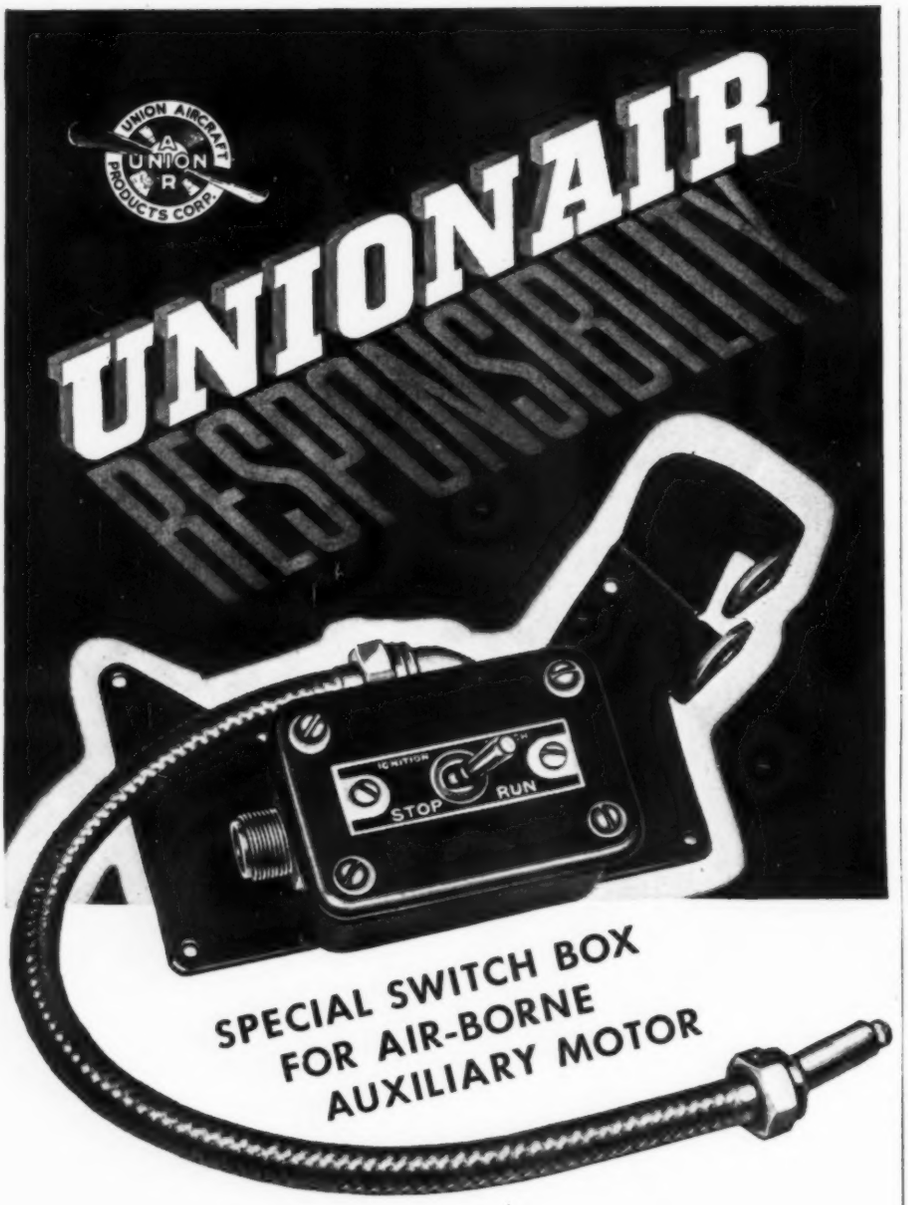
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of orientation pictures which have been called the most potent portrayal yet of America's position in the war. The eventual showing of all these dramatic films to the public seems almost a certainty. Recruiting pictures for the WAC, films illustrating specific problems for commanding officers, and records of tests of new equipment and procedures, made by specially assigned units, are also included in the vast scope of the Production Branch program.

All of this volume of production gives some idea of the problem of supply and distribution of photographic materials, which is the responsibility of the Signal Corps, not just for itself, but for most of the Army, along with the procurement and allotment of the film for the Navy, Marine Corps, Coast Guard and Army, including the Army Air Forces.

From a few thousand letters a month, the V-Mail service has expanded until it is now handling 25,000,000 a month, and still its growth is continuing.

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Radiophoto

(*Continued from page* 218)

conceived by Brig. Gen. Frank E. Stoner, then Signal Officer of the Third Army, and the writer. The assistance of Mr. L. A. Thompson, chief telephoto engineer of Acme Newspictures, was obtained and successful tests were conducted over field wire, commercial telephone, and radio facilities.

The results of these experiments were presented to General Walter Krueger, then Commanding General, Third Army and the Chief Signal Officer at Washington.

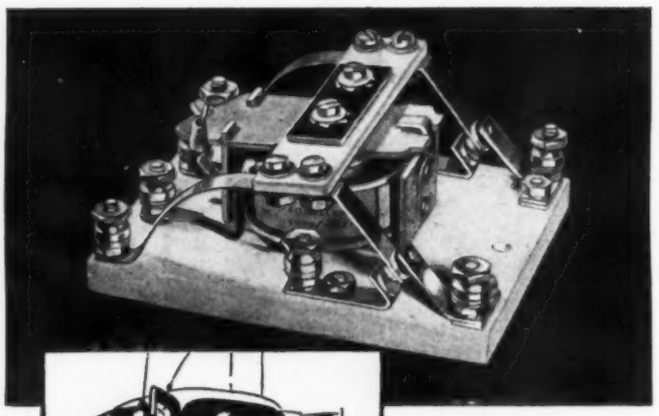
Experiments continued and in June of 1942 the first installation of a telephoto network was made by the Army Communications Service for the wire transmission of maps, charts, and pictures to the various Defense Commands. Equipment was installed in Washington, New York, New Orleans, and San Francisco.

Since traffic was light in those pioneering days, the first equipment at Washington was installed in a renovated broom closet. With the first machine arrived Sgt. Joseph E. Dunn, who handled the operation in the department's infancy—even doing the photographic processing without running water. As the personnel increased, he became chief operator, a position he still holds.

The service was an instant success. By November of that year new stations had been installed in San Antonio, Texas, and Seattle, Washington. These provided the War Department with a contact at each of the four Defense Commands and with the headquarters of the Alaska Communications System.

In January of 1943 the Army Air Forces, faced with the problem of


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Consolidated Radio Products Company facilities are turning out huge quantities of electronic and magnetic devices for use on the world battlefronts. Ingenious mass production methods can supply additional quantities of headsets and transformers to contractors and government agencies.
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TO WIN battles today, there has got to be constant clear radio communication between the Command and all fighting units. Every Headquarters has one or more big mobile Signal Corps Communication Sets, such as the Hallicrafters-built SCR-229, marvels of unfailing efficiency, to receive radioed field reports and beam out orders and so insure correlation of effort. Vital components of these "nerve centers" are Advance Type 400 Relays . . . thousands of them in active action on all Allied fronts.

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THIS new relay, incorporating many improvements, is ideal for transmitting purposes where high radio frequency is being used, It is constructed to provide the same quiet, dependable operation on *alternating* current, free from all "hum" and "chattering" that is normally expected only on *direct* current. Assembly methods and skillful adjustments eliminate any necessity for changing the tension on either the armature spring or moving contact leaves, both of which are set to provide perfect "balance" and complete wiping of the stationary contacts. For further data, write for Bulletin: *Advance Transmitter Relay Type 400.*

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Advance Relays

ADVANCE ELECTRIC COMPANY

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rapid delivery of its meteorological weather charts, conferred with General Stoner, now Chief of the Army Communications Service. As a result of this conference a station was installed at the California Institute of Technology, where the Meteorological Research Division of the Air Forces was then located. From this station weather maps were transmitted to Washington for delivery to the Directorate of Weather.

By this time the section had moved into new quarters in The Pentagon. Equipment necessary to adapt the wire telephoto to radio operation had been designed and manufactured and the first overseas installation was made in Algiers in February.

Capt. Lawrence D. Prehn flew to Africa to install test equipment. Technicians adjusted equipment and experimented with the types of photograph developing and printing best adapted to transmission by radio.

A single test picture—showing Jinx Falkenburg playing tennis—was sent across the ocean more than a hundred times before the technicians were satisfied with the quality of the transmitted photograph.

To make the best use of this new facility the Army Pictorial Service, another Signal Corps component, collaborated with the Bureau of Public Relations in sending a picked group of men to the North African Theater of Operations for the express purpose of shooting good battle pictures for radio transmission.

Capt. John J. Smith, photographer and former picture editor with a national reputation, was chosen to direct the mission. Among the photographers were Ray Scott of motion picture fame; Bob Wallace, one of America's foremost news and illustrative photographers; and several of the nation's better known press cameramen.

Photographs of the capture of Gafsa, radioed to this country and eagerly published, sent the service off to a flying start.

Next came the Sicilian invasion and the Italian campaign in which the photographic team demonstrated its ability in probably the greatest coverage of any series of battles in the history of pictorial journalism. Contributing were the many press photographers to whom the Signal Corps radiotelephoto facilities were made available.

Progress was made, meanwhile, in transmission technique and the improvement is best demonstrated by reproductions of radiotelephoto pictures shown with this article.

Two more stations have since been established in the Southwest Pacific area and plans are under way for other installations in London, Honolulu, and the Orient.

Operation of the equipment is simple, technically speaking. The photograph is clamped to a drum, shaped like a dictaphone record, which revolves at one hundred revolutions per minute. A tiny beam of light—one one-hundredth of an inch square—scans the drum, moving laterally at a speed of one inch per minute.

This beam, reflected to a photoelectric cell by lenses and an oscillating mirror, generates electrical impulses which vary in amplitude with the intensity of the light. This picture-carrying signal, with its 1,800-cycle, is applied to a telephone line.

Another process is necessary, however, before transmission by radio. To limit the effects of fading and interference, which would be disastrous to the picture, the signal is converted from a fixed frequency amplitude modulation to a constant amplitude with a varying frequency.

The signal is fed into a rectifier to get pulsating direct current and through a tube which controls the output of a variable frequency oscillator. The resulting output is mixed with that of a fixed frequency oscillator, then demodulated and filtered.

To receive a picture from this signal it must first be "inverted" back to amplitude modulation. The signal is first amplified and then sent through a pair of push-pull limiter tubes, which restrict the effect of selective fading to minus 65 decibels.

After filtering, the signal is again amplified and passed through a full-wave rectifier whose output, now a pulsating d.c. is fed to the plates of a control tube. The 1,800-cycle output of a fixed-frequency oscillator is applied to the grid of this control tube to provide the picture carrier. The



"Nothing Like Being Rugged, Eh Kid?"



Our mechanized Army must have brains, but brawn still counts. The big fellow wrestling interminably with 155 millimeter shells serves his greedy howitzer with the broad back developed by endless months of bone-tiring drill.

If it cannot take the jolts, vibrations, concussions, and extreme atmospheric variations of mechanized global war, the best electronic fighting equipment in the world is useless. Hearts of this combat equipment — electronic tubes — have two strikes against them from the start. Inherently delicate and fragile by nature, still they must be as rugged as the men who depend upon them.

Bump, vibration, immersion, life, and other punishing tests prove the mettle of Hytron tubes before they leave the factory. More important still, results of these tests form the basis for continual improvements in construction and processing. Throughout manufacture — in stem, mount, sealing-in, exhaust, aging, basing, and test departments — engineers, foremen, and skilled operators are ceaselessly striving to achieve in Hytron tubes not only the tops in electronic performance, but also the peak of dependable stamina which combat demands.



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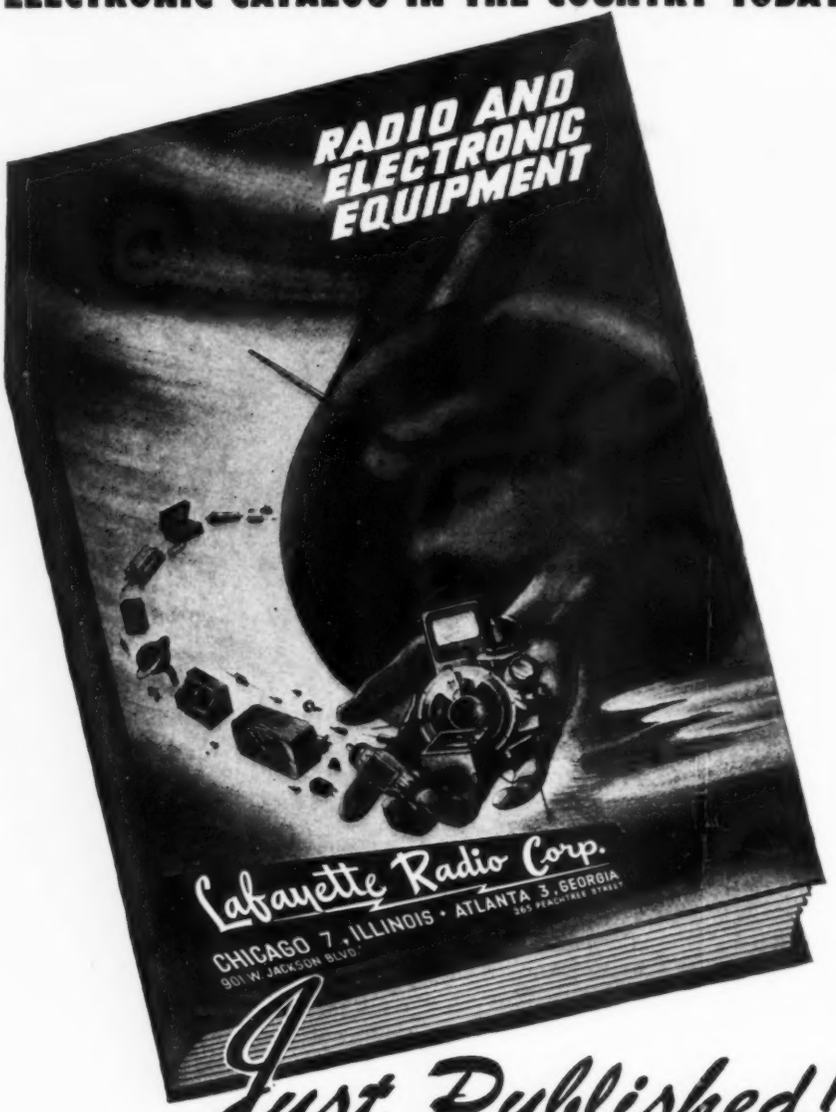
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resultant output may be applied directly to the standard telephoto equipment.

In receiving, the exposure, on the sensitized material wrapped around the drum, is affected by the same light beam used for transmission. The incoming signal, however, is applied to the modulator controlling the swing of the mirror, varying the intensity of the light striking the film.

The original picture is thus reproduced in negative form as the light beam draws thin lines—100 to the inch—across the film on the revolving drum.

Those almost overlapping lines reproduce the picture so faithfully, after it has been developed and printed in the usual mannner, that it is often impossible for any except an expert to detect the difference between the transmitted photograph and the original version.

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Operational Research

(*Continued from page* 162)

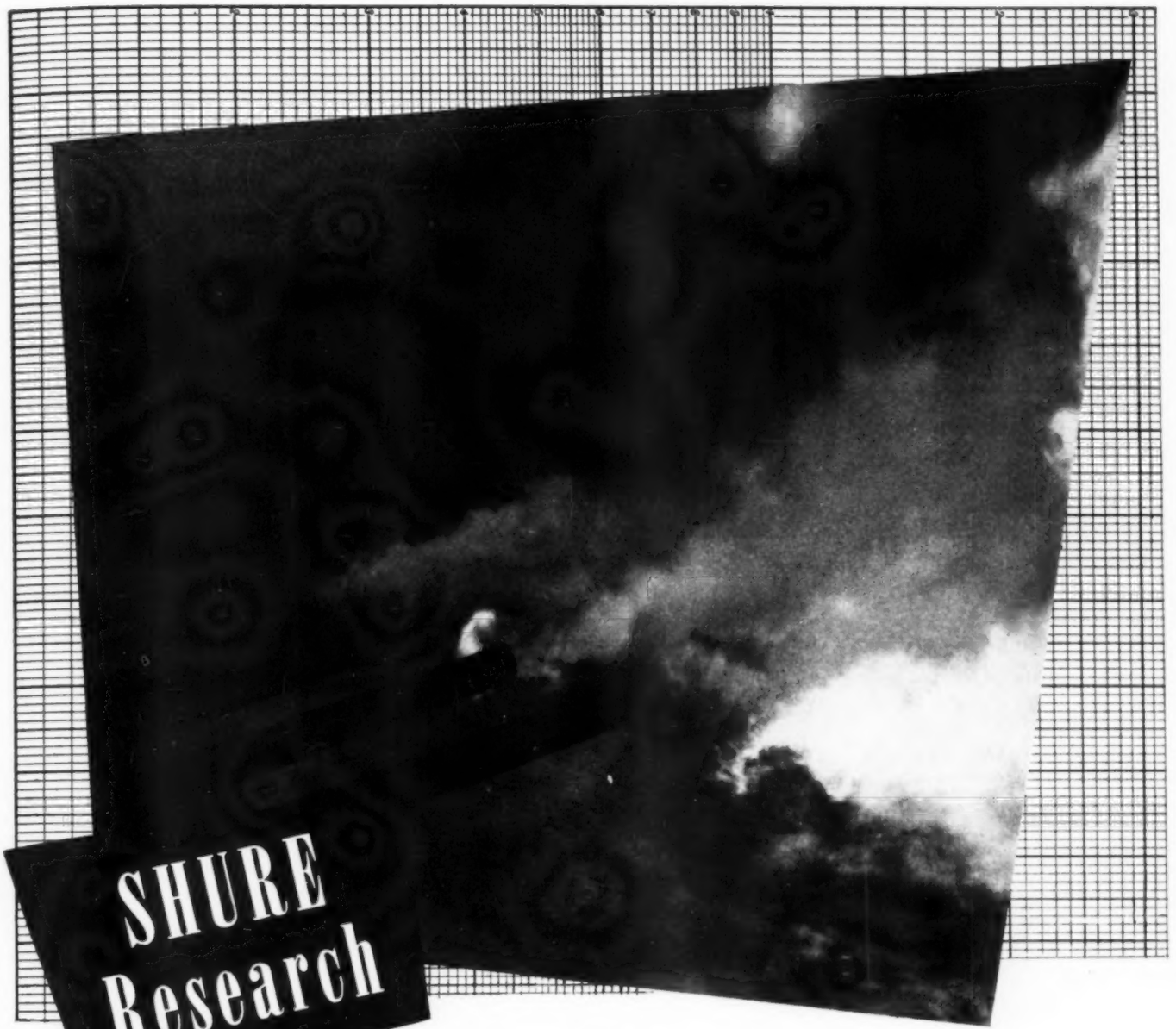
to the other always in mind.

Personnel enter into a communication service in the performance of three major functions; as follows:

1. Personnel originate and receive the messages which use electrical means as a link.
2. Personnel plan the disposition of the equipment for its tactical employment.
3. Personnel operate and maintain the equipment.

In the origination and reception of messages by radio-telephone, the people at the terminals are part of the whole physical system and the performance of the system depends upon how they perform their functions just as much as upon how any coil or vacuum tube works. In military radio equipment, where weight is an important factor, the sets are commonly operated at just about the maximum range at which they can perform. Under these circumstances, the systems are naturally noisy in comparison with ordinary commercial circuits. Therefore, studies have been initiated looking toward improvement by proper speaking and listening procedures. Training methods are being continually developed to improve the operation of the people as a physical part of the system. Other Signal Corps equipment also depends upon the physiological reactions of the operators, their vision, or their hearing; studies are being made of the best methods of training and operating under these conditions.

The officers who plan the use of radio equipment may also perform other staff duties and so not be highly trained in the possibilities and limitations of radio systems or they may be very busy or find it necessary to make quick decisions. Under these circum-



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...in Blast Pressures

In war, a microphone cannot expect to be pampered. It cannot be treated as a delicate instrument operating under carefully controlled conditions. It was a problem of Shure Research Engineers to design a microphone that would efficiently respond to infinitesimal speech pressure, and yet withstand the tremendous pressure of a sixteen-inch salvo—a pressure millions of times as great. Research such as this assures you of a new standard of microphone performance for postwar.

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PERFORMANCE is the real measure of success in winning the war, just as it will be in the post-war world. New and better ideas—production economies—speed—all depend upon inherent **skill and high precision** . . . For many years our flexible organization has taken pride in doing a good job for purchasers of small motors. And we can help in creating and designing, when such service is needed. Please make a note of Alliance and get in touch with us.

ALLIANCE DYNAMOTORS

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—YOUR ALLY IN WAR AS IN PEACE

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stances, the information available may be too highly technical for ready use. The planning of operations may be greatly improved by simplified charts or other methods of presenting information, and studies for the improvement of such presentations have been made by the Operational Research Branch.

Everyone understands that a given gun can shoot only so far. However, no such general fact can be stated about a particular piece of radio equipment because its range under one set of conditions may vary widely from its range under another set of conditions. Equipment is often blamed for failure when it should not have been expected to perform under the circumstances to which it was subjected. The Signal Corps as a supplier has a duty to the using arms who are its customers, to supply the latter with simple and understandable technical information of the capabilities of the equipment it provides so that their plans for its use will be successful.

The operation and maintenance of newly developed military equipment is a particularly difficult problem. The training of personnel for this work cannot follow too closely the practice of civilian schools. When a democracy finds itself attacked and unprepared, it is essential that the soldier be taught enough to do his job immediately but he must not be taught unessential material, or time urgently needed will be wasted. It must also be recognized that when an individual has been taught a complicated job in a school, he does not really know it completely. He cannot be expected to carry it out in all details until he has had repeated practice. Yet he may be needed to perform these tasks at or near the front lines before that field practice has been obtained. This indicates three needs:

1. A careful analysis of the job to be performed.
2. A detailed step-by-step listing of work to be performed when jobs are complicated.
3. Adequate reference literature which can be used to teach the job in the schools and be used again to remind the soldier of his duties in the field. On complicated tasks, in the maintenance of large equipment, this literature must be of the handbook or reference type.

The job analysis of the operation and maintenance of radio equipment has been broken down into three groups:

a. Operating.

Turning the set on and off, proper tuning and adjustment, sending and receiving of messages.

b. Preventive Maintenance.

Preventive maintenance is the process of so operating and taking care of equipment that it will perform at its maximum efficiency and breakdowns will be reduced to a minimum.

c. Equipment Repair.

In spite of the best of care, equipment will inevitably have some failures. Men must be taught how to locate the troubles rapidly and make the proper repairs.

The Operational Research Branch has made extensive studies of the literature and procedure required for certain of the newer types of Signal Corps equipment. It has paid particular attention to the problems of preventive maintenance. It has developed a log system based on extensive broadcast engineering experience by which large and complicated equipments can be checked by inexperienced men and corrective measures taken before trouble has developed to a point where operation of the set would be interrupted. In this way, not only is improved performance obtained but the need for spare parts to correct failures can be reduced. The log system also serves a double purpose by supplying information, regularly and in sufficient quantity, which may be used as a basis for improvement of equipment.

The morale of personnel has been recognized as an important contribution to success in battle. If the personnel believe that they have good equipment, that they are well trained in its use, that they will be able to keep it operating, and that they have technical information and well trained officers to fall back on when they get into difficulty, they will turn in a much better job. These, of course, are technical factors over and above the general factors of proper housing, food, clothing, and recreational facilities. These factors are of equal or greater importance when

Who can use this after the war?



So far this is definitely a war baby. It was born to meet an exacting wartime need. Every one that is made goes right into the fight.

It is an electric motor designed for jobs which no regular electric motor could fill.

The jobs are on America's fighting planes. Working control flaps—opening and closing cooling shutters—lifting landing gears—and the like.

Every ounce on an airplane is precious. So usual electric motors were out.

This one weighs as little as 8/10ths of a pound—others can move as much as 35 tons.

Naturally it took a whole new kind of engineering to make this motor.

It took new ideas from the drawing board up. It took new materials—like glass-insulated wire—to build it. It required finer, more precise craftsmanship than had ever gone into a motor before.

After the war, these motors can be sold to manufacturers of peacetime products.

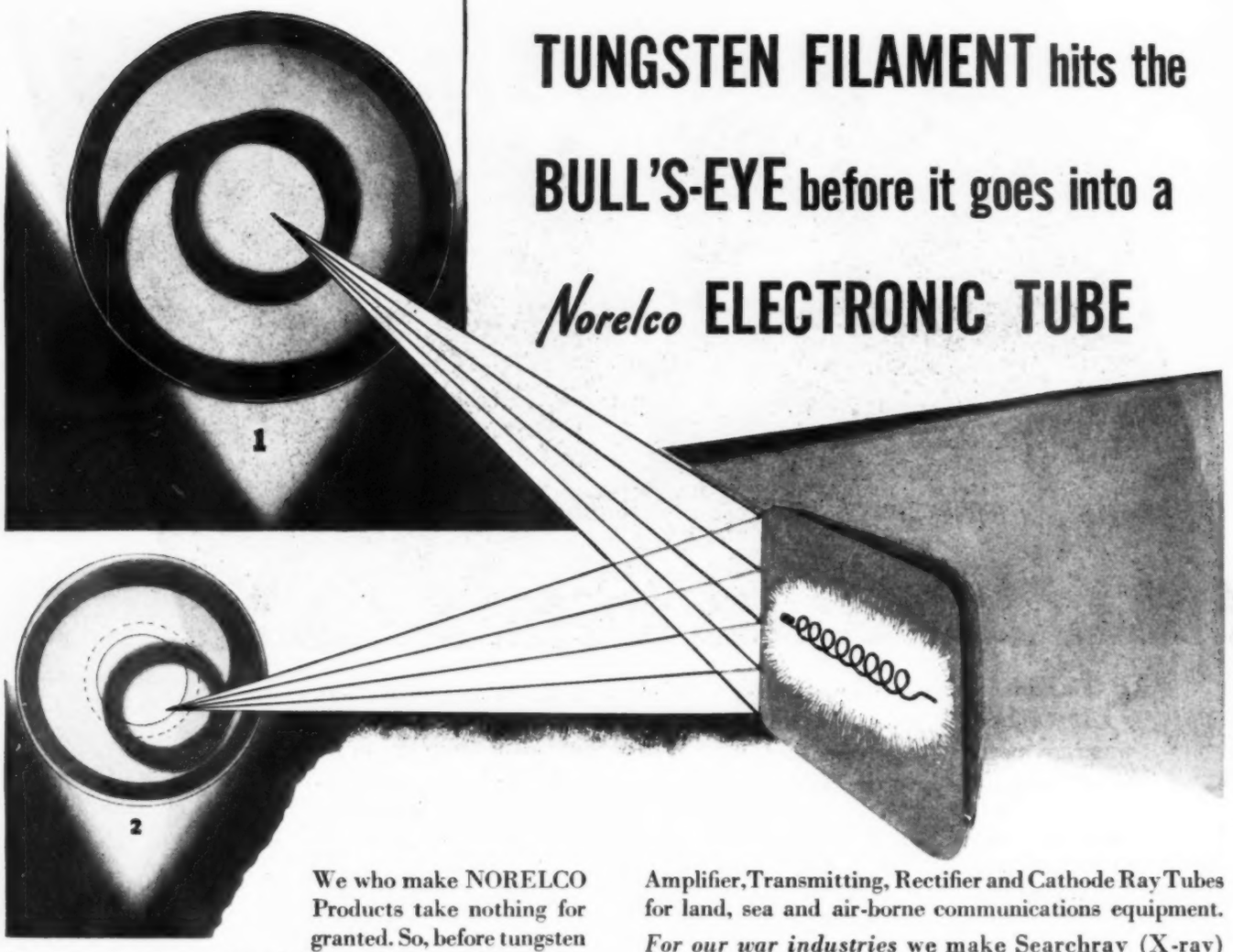
That is why we are telling you about them now.

You may have need for such a compact, ultra-efficient source of power. You may be able to use the kind of engineering thinking that developed it—or the production technique that builds it and about 250 other Lear products.

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We who make NORELCO Products take nothing for granted. So, before tungsten filament coils are anchored to assemblies in tubes, they go into the limelight of a slide film projector. The projection beam is focused squarely through the dead center of the coil, and is projected against a screen on which a circle is painted.

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Today, all our resources and experience are devoted to making the electronic tools and devices that will hasten Victory. Tomorrow, they will be free to serve industry in creating a new world.

For our Armed Forces we make Quartz Oscillator Plates; Amplifier, Transmitting, Rectifier and Cathode Ray Tubes for land, sea and air-borne communications equipment.

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2½- inch—1 inch deep



For radio and other communications service: Type DW-51 d-c voltmeters, ammeters, milliammeters, and microammeters; Type DW-52 radio-frequency ammeters (a-c thermocouple-type). Cases are brass or molded Textolite.

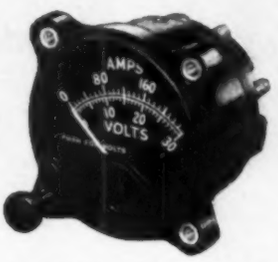
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These new, internal-pivot instruments were developed to fill a vital need—particularly in the radio and aircraft fields—the need for compactness. They are *thin*—in most ratings, less than 1 inch deep.

More important is the way their thinness was achieved. In the sketch below, see how the pivots are solidly anchored to the *inside* of the armature shell so they cannot work loose. The moving parts are permanently aligned with stationary parts by bolting the core assembly to a one-piece cast-comol magnet.

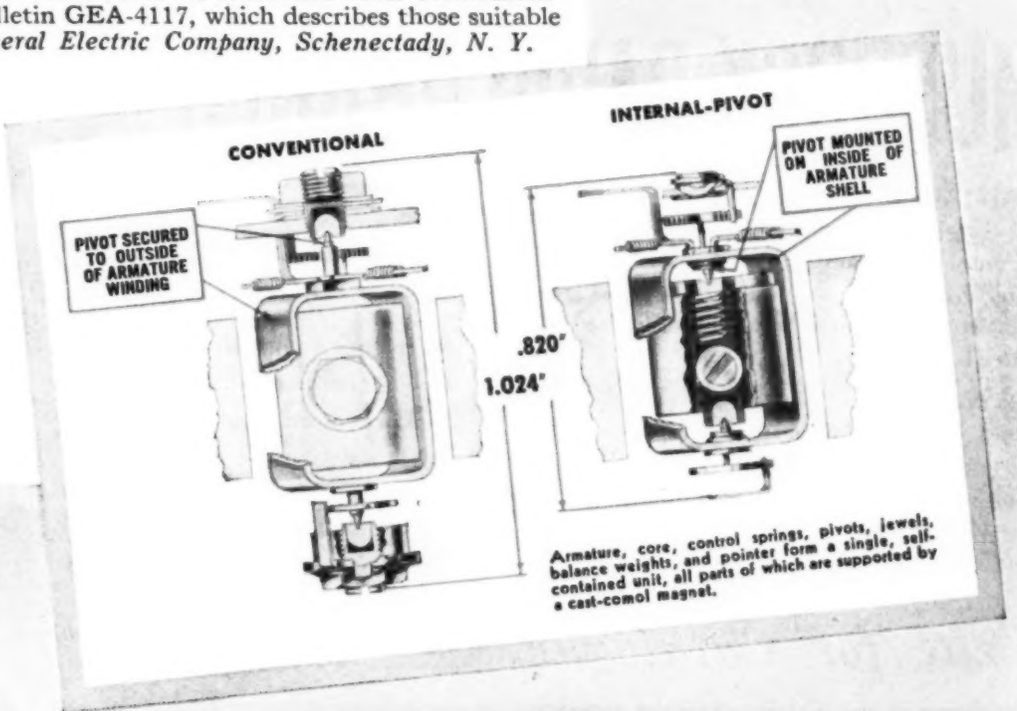
Other features are: large-radius pivots, high torque and good damping, lightweight moving element, and ample clearances. Added up, they give you an instrument well able to withstand vibration and hold its rated accuracy, one that is fast on response and easy to read accurately—a design that packs all-round fine performance in a small space.

For ratings, price, and dimensions, ask our nearest office for Bulletin GEA-4064, which covers instruments for radio and other communications equipment; or Bulletin GEA-4117, which describes those suitable for naval aircraft. *General Electric Company, Schenectady, N. Y.*



Type DW-53 d-c voltmeters, ammeters, and volt-ammeters that are specially designed to measure voltage and current in battery and battery-charging circuits on naval aircraft. They meet applicable Navy specifications.

Invest in your future BUY WAR BONDS



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NOTICE the soft sponge-rubber pads on the earphones above! They rest gently on the ears—are comfortable to wear for the many long hours on duty. And for *extra* comfort, MURDOCK Radio Phones are ventilated!

With this unusual comfort, MURDOCK guarantees super-sensitive, surprisingly clear reception—ruggedness that *stands up* under toughest operating conditions. That's why this precision-engineered Headset is preferred by radio experts for both military and civilian use.

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We're busy—but still have facilities for making more Radio Parts on a sub-contract basis. If you need outside manufacturing aid in this field, please write us!

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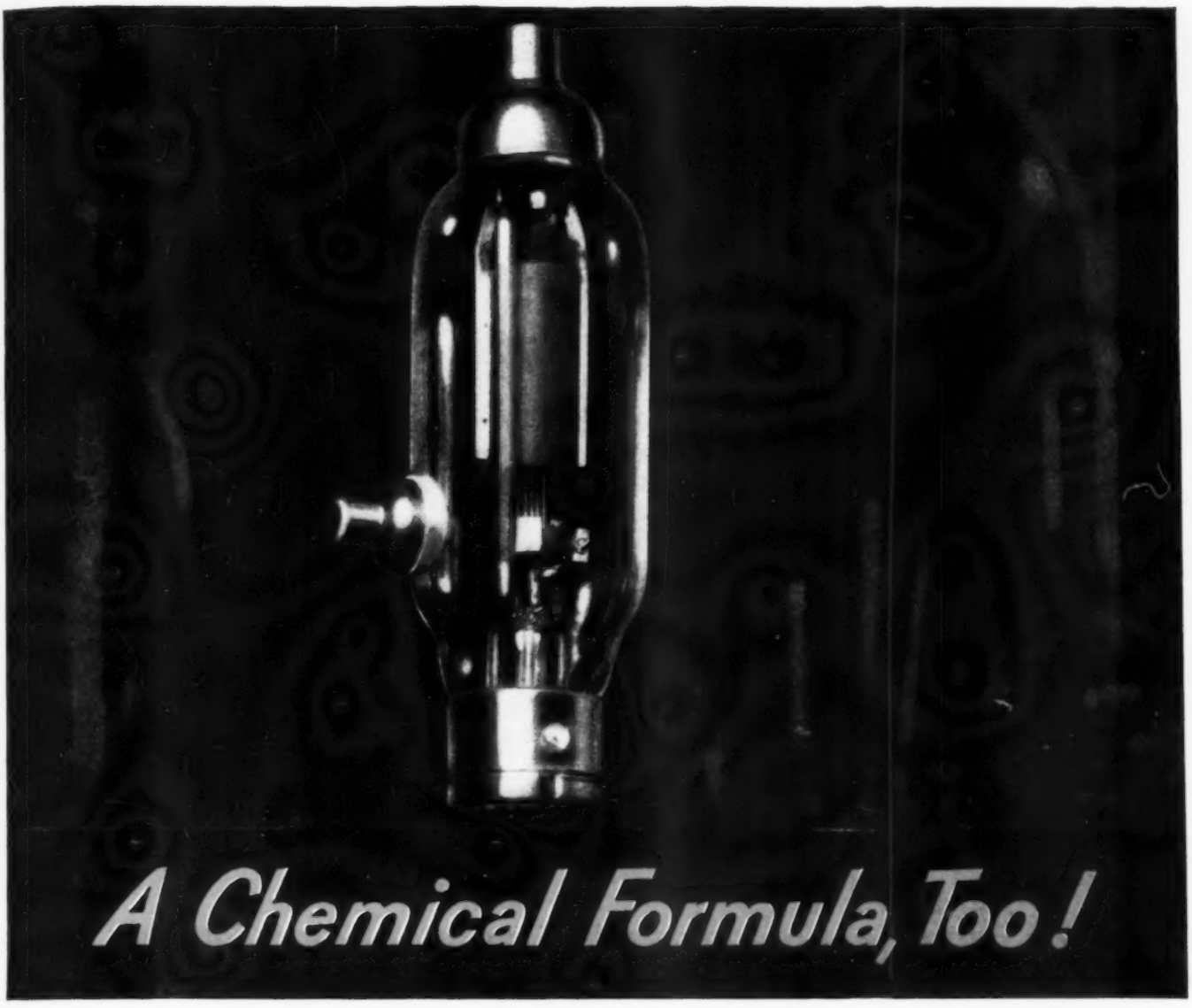
the chips are down and performance in the field is the only thing that matters. Men can and will be proud of properly operating equipment and systems and will do their utmost to attain it if they believe it possible but will be equally indifferent if they are unable to produce results. These are all problems considered by operational research.

The performance of a radio link involves the use of equipment provided by man and a medium provided by God. However, the place where we must use the medium may be determined by the devil (the enemy). For many years, radiomen devoted themselves exclusively to a study of how equipment could be made bigger and better but were baffled by the vagaries of the medium in between. More recently, studies of the mechanism of the propagation of radio waves and how they are launched from antennas has provided knowledge of how to obtain improved results from radio systems.

The first studies of broadcast station performance were made by asking listeners to send in postal cards reporting reception. On this basis, very little planning of the anticipated performance of new stations could be done. When the technique of field strength and antenna efficiency measurements was developed, real engineering and planning became possible and is now the accepted method.

Point-to-point communications systems have more commonly been judged by service tests in which a particular set is tested under particular conditions. But such tests do not provide the information on which new systems can be planned for new situations. The performance obtained in a service test is a combination of many factors. Individual factors must be isolated in order to do engineering planning. In fact, that is the essence of the engineering method. As a contrast, the inability to isolate individual factors has always been the despair of those who have tried to reduce economics and other social studies to a scientific basis. As a first step factors involving equipment should be isolated from factors involving the terrain in the performance of a radio link. Then it will be possible to study terrain alone and predict how available equipment will perform under a new set of conditions, without testing every single set under these conditions. The importance of this is obvious when sets originally developed and tested in the United States must be used in the jungles of New Guinea, the snows of the Arctic, or the sands of Africa. There is not time to test all these sets individually all over the world before we send them out in large quantities to perform crucial tasks. The Operational Research Branch studies methods by which set and theater factors can be isolated, and works in cooperation with the Signal Corps laboratories in obtaining the analysis needed.

The improvement of equipment also requires an analysis of individual fac-



A Chemical Formula, Too!

Chemistry is but one of the many sciences which are collaborating at National Union in the work of producing better electronic tubes for today's vital war assignments. Indeed, our chemists are playing a decisive role in making National Union Tubes *measure up* to the precise standards of scientific instruments.

Thanks to chemical research, we know for example that not only must the formula of a tube's emission coating be *right,* but also the application and processing methods must be rigidly controlled.

To effect such control our chemists, in cooperation with the engineers of our Equipment Division, designed, built and put into production a new type automatic coating machine. Operating in an air-conditioned chamber, this equipment provides exact control of both the coating operation and the chemical processing of the emission coating—free from all extraneous elements.

When making post-war plans, keep in mind that tube manufacture *is* a many-sided scientific business. To get the tubes and up-to-the-minute service data you need—*count* on National Union.

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*Approximate. Number fluctuates with model and combat requirements.

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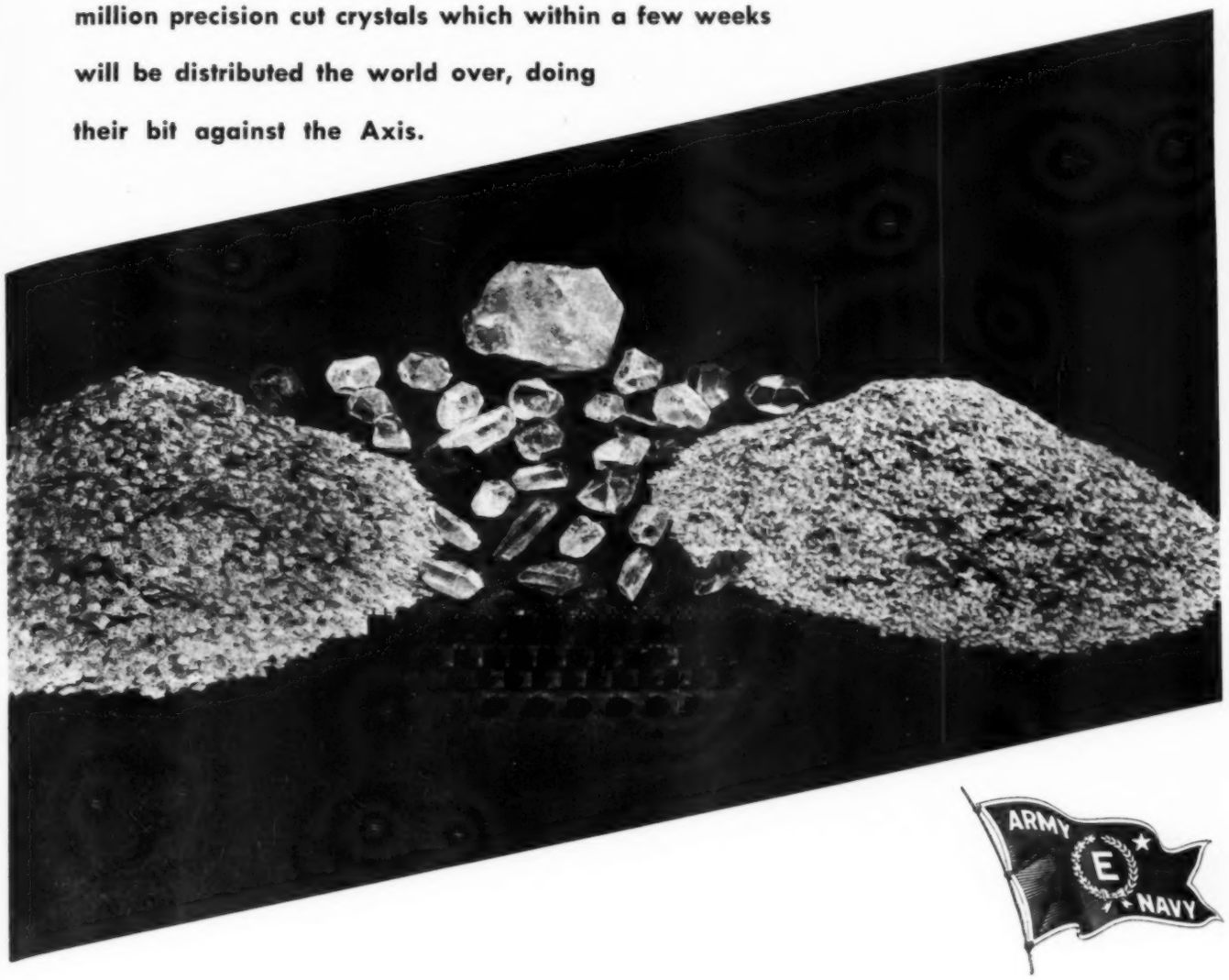
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tors. If these individual factors are compared with carefully prepared charts showing the best modern practice, the weak and strong points are discovered. Then the point where emphasis should be placed in a development program, to accomplish the best results in the shortest time, can be quickly determined.

The Operational Research worker bears the same relation to the field operation of equipment as the industrial engineer does to the production of equipment. As industrial engineers constantly study better methods of production, the Operational Research Branch of the Signal Corps studies improvements in the use of equipment. It is not itself an operating group as it does not operate equipment nor does it direct the tactical operational procedures. Others are busy doing this and follow prescribed Army practices. The Operational Research Branch studies the operations and operational procedures from a detached engineering viewpoint and suggests to the operating groups new and improved methods aimed at a better over-all Signal service.

—30—

Operations

(*Continued from page* 124)

keep their fingers on the pulse of all communications organizations in the field. In this way the manner in which communications are used in the various combat areas is made public to commanders in other areas so that they may benefit by the experience in other theaters of operation. For example, in the North African campaign it was found that an armored signal battalion needed more wire. Its radio communications did not suffice due to heavy traffic and crowded frequencies. As soon as C.C.B. officers learned this from reports which they received, they immediately turned this information over to other theater commanders and also redirected Signal Corps training to incorporate this new doctrine.

Its work with the Communication Coordination Committee and the Signal Corps Board is that of coordinator, for when cases are submitted to the Chief Signal Officer, it is frequently C.C.B. which gathers the material and submits the problem to those two agencies and it is C.C.B. that receives reports from those two committees and forwards them with all recommendations and background material to the Chief Signal Officer for his final approval or disapproval. If a case is approved, it is C.C.B. that issues the directive for the Chief Signal Officer's signature and which follows through to see that the provisions of that directive are carried out.

Intelligence Branch

Military Intelligence is a glamorous term that covers just plain hard work.

For complete, balanced, fully guaranteed instrumentation . . .



DuMONT makes both

➧ DuMont cathode-ray specialists have compiled and published a manual and catalog just off the press. This book is replete with valuable data on cathode-ray principles and practice, as well as descriptions and listings of DuMont tubes and equipment. Write on your business stationery for your registered copy. And do not hesitate to submit your cathode-ray problems for engineering collaboration.

➧ Yes, DuMont makes both – cathode-ray tubes and instruments. Pioneer of the commercialized cathode-ray art, DuMont has always insisted that such equipment be developed, designed and built as a thoroughly coordinated whole, since basically the equipment is but an extension of the cathode-ray tube itself.

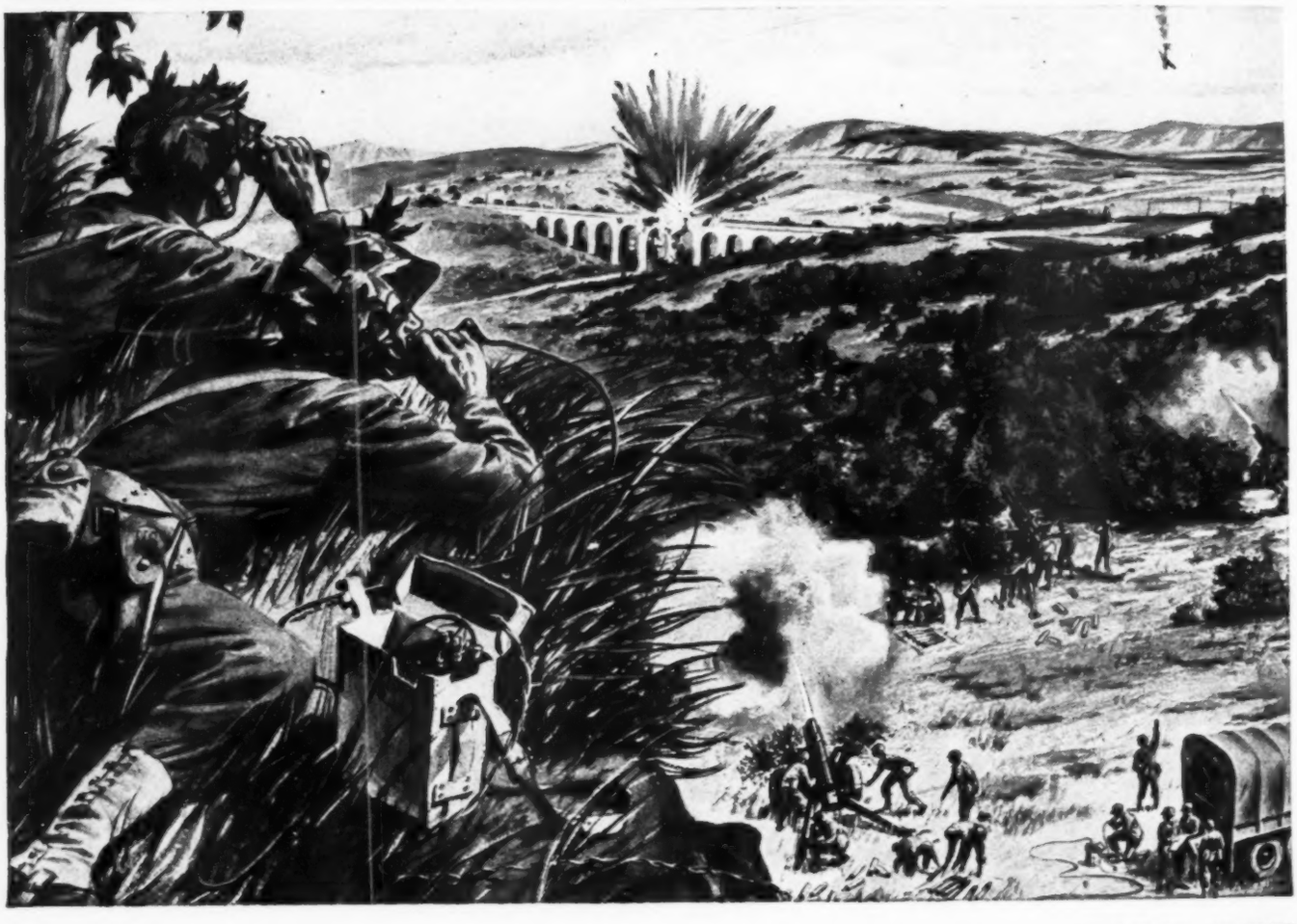
➧ That is why DuMont tube specialists and instrument makers work side by side. Latest tube developments are immediately available to DuMont instrument makers. Contrariwise, as DuMont instrument makers evolve new circuits or functions, they can count on corresponding tube characteristics. Meanwhile four DuMont plants translate that ideal coordination into up-to-the-minute tubes and instruments.

➧ Always remember, DuMont makes both – tubes and equipment – for that complete, balanced, fully guaranteed instrumentation.

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They work together better because they can talk together . . .

In this lightning war
Of mechanized equipment
Our forces are striking *fast*
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No small credit for this
Goes to the Signal Corps . . .

Wherever new fronts
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Wherever the fighting is thickest
There you'll find
The soldiers of the tube and wire . . .

And with them on a hundred battle lines
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This apparatus is helping the armed services
Work together better
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AN IT&T ASSOCIATE



Although "cloak and dagger" activities are part of Intelligence, they are only a minor aspect of a far reaching service. As far as the Signal Corps Intelligence Branch is concerned, it has two main functions: To learn everything it can about the enemy's signal equipment, doctrines, and uses; and to keep the enemy from learning our own.

The first part of this job is known as "intelligence"—to get down to definitions; the second part is known as "counter-intelligence."

Knowledge of enemy activities comes to the Signal Corps Intelligence Branch in many ways, but mainly through the Military Intelligence Service, commonly known as G-2. Every morning a representative of the Signal Corps Intelligence Branch sits with representatives of all other branches and services of the U. S. Army at G-2 headquarters and receives all reports, statements, documents, etc., that G-2 received the previous day. These reports are analyzed by the representatives, and where one of them pertains to communications, it is turned over to the signal representative. These reports are then brought back to a review committee in Intelligence Branch that evaluates the documents and breaks them down into component parts. They are then disseminated to the specific branch or service within the Office of the Chief Signal Officer which may be concerned. This latter is done in two ways—through a daily summary of communications reports, and also through direct dealing when, in the opinion of Intelligence officers, such a procedure is necessary.

This war, if anything, is an electronics war and the advances, being made in this art, see-saw back and forth so that it is vital that American signalmen be kept right up to the minute on what the enemy is doing.

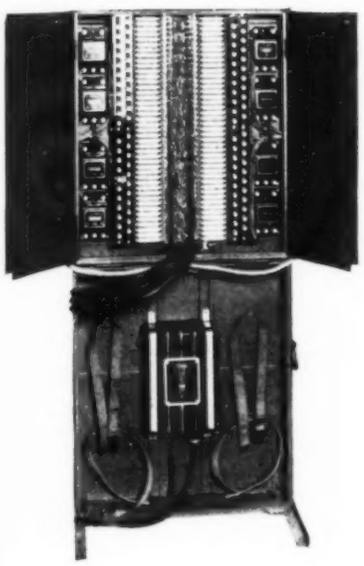
In the main this gathering and dissemination of Intelligence Information is the major function of the Intelligence Branch of the Office of the Chief Signal Officer. As important, but not as large, is the counter-intelligence function of this Branch. Not much may be related of the details, but in general the Branch is responsible for the investigation of military and civilian personnel that work for the Office of the Chief Signal Officer, keeping records of personnel who have been cleared for working with classified information and takes measures to prevent or combat disloyal activity.

Another important part of Intelligence's work is an evaluation of reports from Signal Corps officers and observers in the field and on maneuvers concerning equipment, doctrine, usages, and so on. These reports are broken down and sent to the various branches of the Office of the Chief Signal Officer concerned as well as to the Army Ground Forces, Army Service Forces, and Army Air Forces. In addition, recommendations are drawn up and action initiated to carry out these recommendations.











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We take great pride in the fact that Stromberg-Carlson equipment is meeting the rigid requirements of the Signal Corps. Today we are making a wide range of units for Army and Navy use, including field switchboards, field telephones, portable switchboards, and equipment for mobile and stationary use. All Stromberg-Carlson communications equipment is backed by an experience record of 50 years, and the pledge to our customers that "There's nothing finer than a Stromberg-Carlson." Stromberg-Carlson, 100 Carlson Road, Rochester 3, New York.

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DESIGNERS - MANUFACTURERS

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It was in the landing in North Africa early in November of 1942 that information came to the attention of Intelligence Officers of the need for waterproofing of Signal equipment. By the time of the invasion of Sicily, much had been done along these lines and when the American Fifth Army established its beachhead at Salerno, the Signal equipment they carried with them had been protected against the corrosive effects.

As American troops have moved forward and have rolled back enemy soldiers, much German, Italian, and Japanese signal equipment has fallen into their hands. Since one of Intelligence's main functions is to know all it can about enemy equipment, the establishment of an enemy equipment identification service in the Intelligence Branch has been of outstanding benefit to the Army during the past year. When American soldiers capture enemy equipment, it is sent directly to this service, which forwards it to the Signal Corps Laboratories for analysis, evaluation of strategic materials, and operating knowledge. This service keeps records of all signal equipment, including photographs, and coordinates the information thus obtained on enemy equipment with our Allies and other Federal agencies.

That this training has paid dividends has been authenticated innumerable times. One instance should suffice. During the last stages of the fighting in Tunisia an advanced American Infantry patrol, whose radio equipment had been put out of commission during an air bombing attack, found two abandoned German reconnaissance cars. Taking them over for their own use, they found that the radio sets with which the vehicles were equipped were but slightly damaged. A few minutes for repair, and the Americans were back on the air, in communication again with their own headquarters.

Two rather small groups within Intelligence Branch round out the work of this organization. One group prepares communications surveys on foreign countries which might be the scene of military operations. The other unit prepares and distributes the Signal Communications Equipment Directory, a list of all Signal equipment of the United States, the United Nations, and of the enemy.

As you read this article, it may be that new operations somewhere on the face of this earth have begun. Or if none has occurred recently, you can be assured that it won't be long before not one but several will be in progress. In any event, you will know that the signal men and equipment helping make those attacks possible were the result of painstaking, ceaseless work that went on in the Plans and Operations Division of the Office of the Chief Signal Officer. That the men, who wear the crossed flag and torch of the Signal Corps, who staff this office, jammed the orders through that gave the commander of the operations enough Signal men and material—on time!

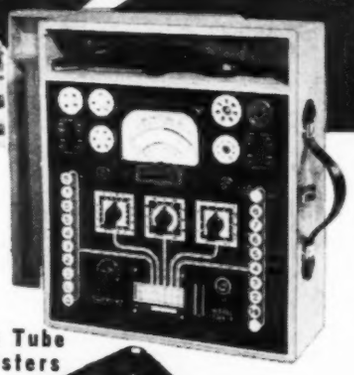
—30—



Allied lives . . . Allied victories . . . depend on [illegible] the Communication waves and [illegible] channels of communication [illegible]

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Signal Generators

Lend-Lease

(Continued from page 215)

International Aid has contributed to a greater standardization than ever before existed. The lessons learned from our Allies have made it possible for us to improve equipment furnished to our own forces. Likewise, through the use of our equipment our Allies have found it possible to incorporate certain features of American design.

One of the most common items in the Signal Corps catalog, perhaps, is the field telephone. This is a battery operated telephone of which many thousands were shipped to Russia. But in the almost incredible below-zero temperatures of the Russian front in midwinter, the batteries normally supplied with this telephone were not satisfactory. The Russians had a "non-freezing" battery larger and heavier than its American counterpart. To accommodate this battery, a special modification of the field telephone was developed which operates successfully under varied climatic conditions.

Equipment used in the Libyan Desert is subject to wear and strains unheard of heretofore. Dust and sand penetrate every moving part and grind surfaces as if with an emery wheel. This has demonstrated the necessity of shielding and enclosing moving parts more completely to ensure at least a reasonable period of useful life.

Designed as a means of aiding others, Lend-Lease has shown itself to be of real value to ourselves. Tried and tested in actual combat, under all kinds of climatic and geographical difficulties, equipment used by both ourselves and our Allies paid worthy dividends by way of reliable experimentation. From these struggles came recommendations, by Signal Corps engineers and foreign government representatives, for improvements and refinements. Lessons have been learned and the Signal Corps will continue to utilize the laboratory of battle as its testing ground for continued research, development, and production of the best communications equipment.

The Signal Corps, by careful and studied analysis, made technical recommendations of significance, eliminated procurement obstacles, and concentrated upon standarization of maintenance and replacement parts groups. Through diligent planning, it contributed toward keeping the production lines running smoothly, constantly, and with least possible time-wasting changeovers.

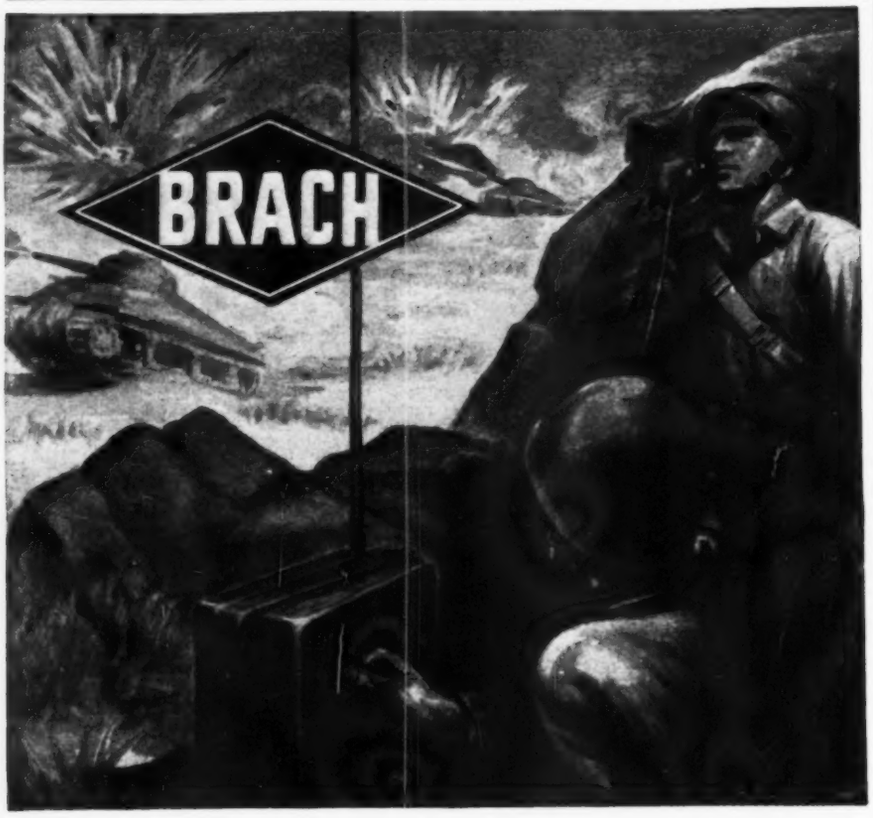
Emphasizing the flexibility of Lend-Lease shipments, whenever the occasion has arisen, the Signal Corps, pursuant to authority of the Combined Munitions Assignments Board, has halted the export of materials, already delivered to representatives of Lease-Lend countries, at portside in order to fill the unexpected needs of the United States or of another of the United Nations.

Thousands of Signal Corps component items were made available through Lend-Lease to foreign manufacturers to be installed in complete units. Walkie-talkies, mobile radio stations, and even portable radio sets used by ski troops were just a few of the purposes that Lend-Lease Signal Corps materiel served.

Discussing reciprocal aid between the United States and other nations, General Marshall said in his recent report:

"A feature of Lend-Lease is the so-called Reverse Lend-Lease, the term applied to the furnishing by other nations of supplies, equipment, services, facilities, and patent rights to the armed forces of the United States without cost. The most important single contribution of Reverse Lend-Lease in the war effort has been its saving in shipping requirements. Reverse Lend-Lease also reduced demands on United States raw materials, production facilities, and manpower. It further contributed to the more efficient utilization of all the productive resources of the United Nations.

"Overseas commanders of American forces have been directed to utilize all available sources of local supply on a Reverse Lend-Lease basis. Procurement organizations have been established in the principal theaters of operations to obtain supplies locally for American forces and to assist in the development of local resources. Within the United Kingdom, in the fiscal



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Today, BRACH produces only for Victory. But after the war, Brach will be ready with trained craftsmen and still more "know-how" to turn out superior antennas and other radio and electrical products for which dealers and public have been patiently waiting.

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year 1943, 1,500,000 ship tons of materiel were provided the United States forces stationed there, in addition to a large quantity of construction materials. Had all these supplies been shipped overseas in American vessels, it would have required more than 500 fully loaded ships. In Australia and New Zealand, American forces have obtained almost all their food requirements locally. In the Middle Eastern Theater the British have provided, for United States forces, all maintenance requirements, including food supply, clothing, and equipment."

To the Signal Corps in particular, reciprocal aid has been especially valuable. Secret scientific instruments, as well as other types of apparatus and information not available in this country were exchanged and placed at the disposal of our engineers and laboratories for research and developmental purposes.

During the year a foreign film section was set up by the Army Pictorial Service of the Signal Corps to exchange training films with other nations and to re-score War Department training films for Latin American countries and China. By the end of the fiscal year, 100 titles had been completed in Spanish and 84 in Chinese. Preparations were made to re-score films in Russian and French. All British training films were reviewed and prints obtained for those needed by the War Department.

In addition to Lend-Lease activities, a number of civilian experts have been furnished by private industrial organizations as observers to accompany field forces overseas. These experts, most of them engineers of high standing, went to such places as Cairo, Australia, Hawaii, England, the Southwest Pacific, North Africa, and elsewhere. They accompanied the troops in actual combat to assist in operation of equipment and to observe its performance. Reports received from them have been of great value to troops in the field and to the Army Service Forces.

To no field of military endeavor has American inventive genius made more distinct and vital contributions in World War II than to the communications and reconnaissance systems, dominated by radio. These developments have made it possible for a single man to direct combat troops from the skies. An air battle may be directed from the ground. Man may be brought to a central sector by the use of radio communications in a matter of hours.

The importance of these communications and the wartime responsibilities of the Signal Corps are described in the following statement by Robert P. Patterson, Under Secretary of War:

"As warfare has come to call for the rigorously calculated deployment of vast masses of mechanized might—mobile guns, tanks, troop carriers, surface vessels, submarines, and airplanes—one particular phase of the problem of supply has become of crucial central importance. This is the supplying of information—the right information, swiftly and accurately transmitted to the right place, at the right time. Without this, all else fails, for without it the close-working cooperation of varied forces moving at great speeds becomes impossible, control is lost, command is balked.

"The Signal Corps of the Army of the United States is expected to 'get the message through'—to establish and maintain swift and accurate communication wherever the lines of battle may be drawn. It is, therefore, in this war charged with the heaviest responsibilities in its history. We may look with confidence for the devoted performance of those responsibilities and to the victory to which that performance will so greatly contribute."

—30—

Engineering

(*Continued from page* 117)

If development is to be done by a commercial laboratory or manufacturer, in most cases one of the Signal Corps laboratories prepares a development specification, places the contract, and guides the development from the standpoint of performance and quality requirements to meet service needs. If development is to be by N.D.R.C., the

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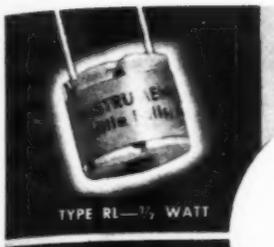
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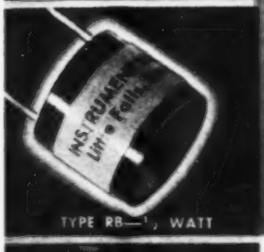
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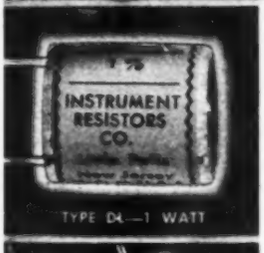
















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IN-RES-CO APPLICATION-DESIGNED RESISTORS



Proof of the outstanding quality of these highly-accurate, precision-made electronic components is their wide specification in communication and control applications for every branch of the Armed Forces. The multiple electrical and dimensional advantages of IN-RES-CO fixed and adjustable resistors, meter shunts, choke coils, meter multipliers, solenoids and special coils—plus their mechanical ruggedness and ingenuity of design—assures the extra degree of dependability required for military successes.

IN-RES-CO precision units are ideally suited for post-war plannings because each is application-designed for specific functioning. By specialization, IN-RES-CO resistors are offered without price premium for their extra quality . . . custom windings at stock prices. Inquiries—for present essential, or future industrial needs — are invited. Literature on request.

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In nearly a half century of manufacturing electro-mechanical components, Chicago Telephone Supply Company has gained world-wide recognition.

Throughout these years, manufacturers have become accustomed to the high quality workmanship and downright dependability of Chicago Telephone Supply products.

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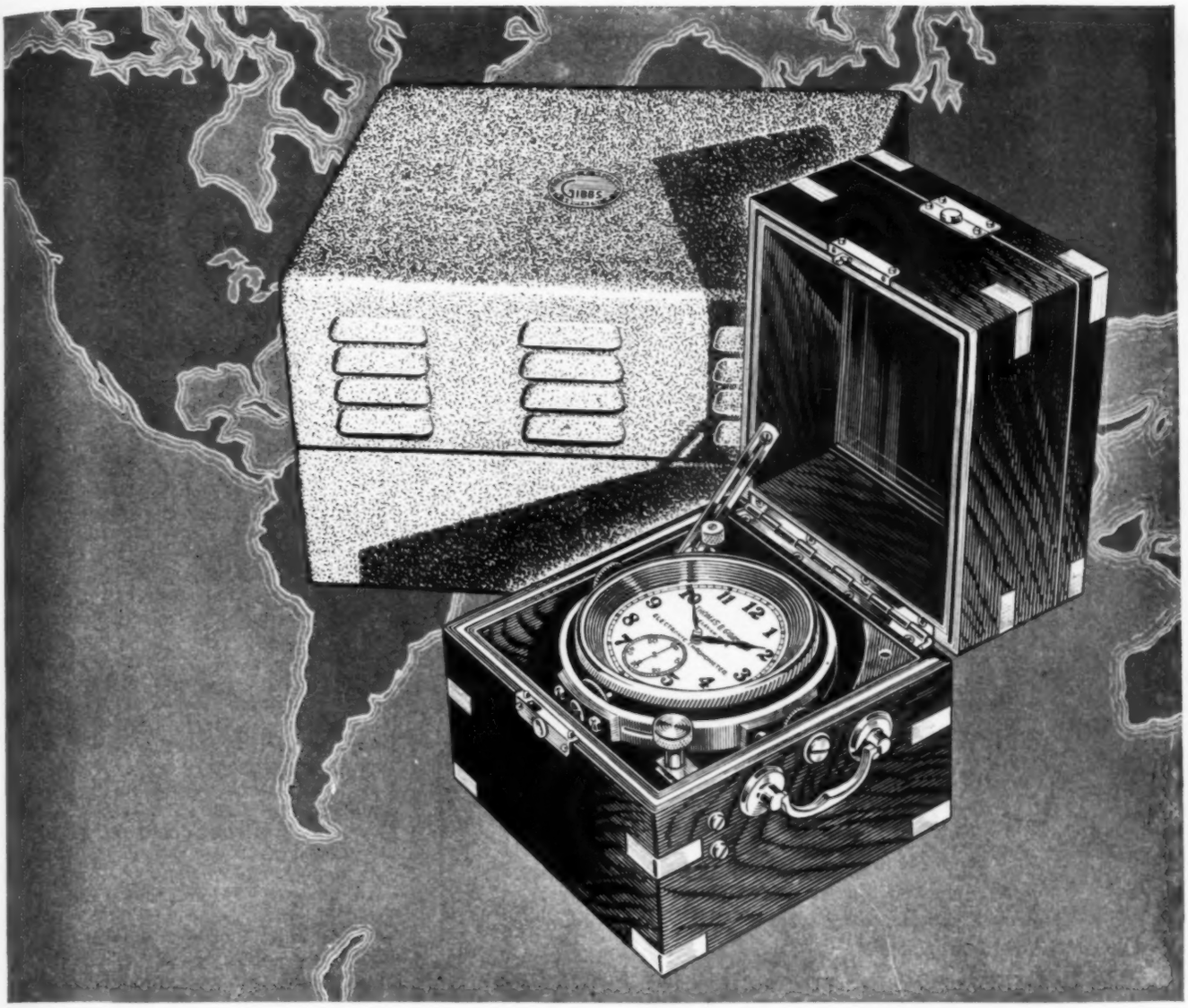
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LABORATORIES

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The impelling necessity for war production will truly be reflected in the post war period by vastly improved communication systems, both in radio and television equipment.

In the future people will enjoy the luxury of these ultra modern communications through Harvey-Wells experience gained in war production . . . the instrument will be more compact—homes will enjoy them . . . all cars will have them . . . factories will use them . . . boats, planes and trains will demand them . . .

However, at the present time we plege ourselves to see that our war jobs are delivered on time and to the best of our individual efforts.

★

HARVEY-WELLS
COMMUNICATIONS
Are Helping to Win the War

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HEADQUARTERS
For Specialized Radio Communications Equipment
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laboratories assist when needed for the interpretation of service needs.

By far the greater part of Signal Corps research and development is effected in this way. In some cases, however, the facilities of the Signal Corps' laboratories are employed to carry out the detailed design work. There are two groups of these laboratories which are operated as part of the Engineering and Technical Service of the Signal Corps, namely:

Signal Corps Aircraft Signal Agency, which includes those laboratories working on aircraft equipment.

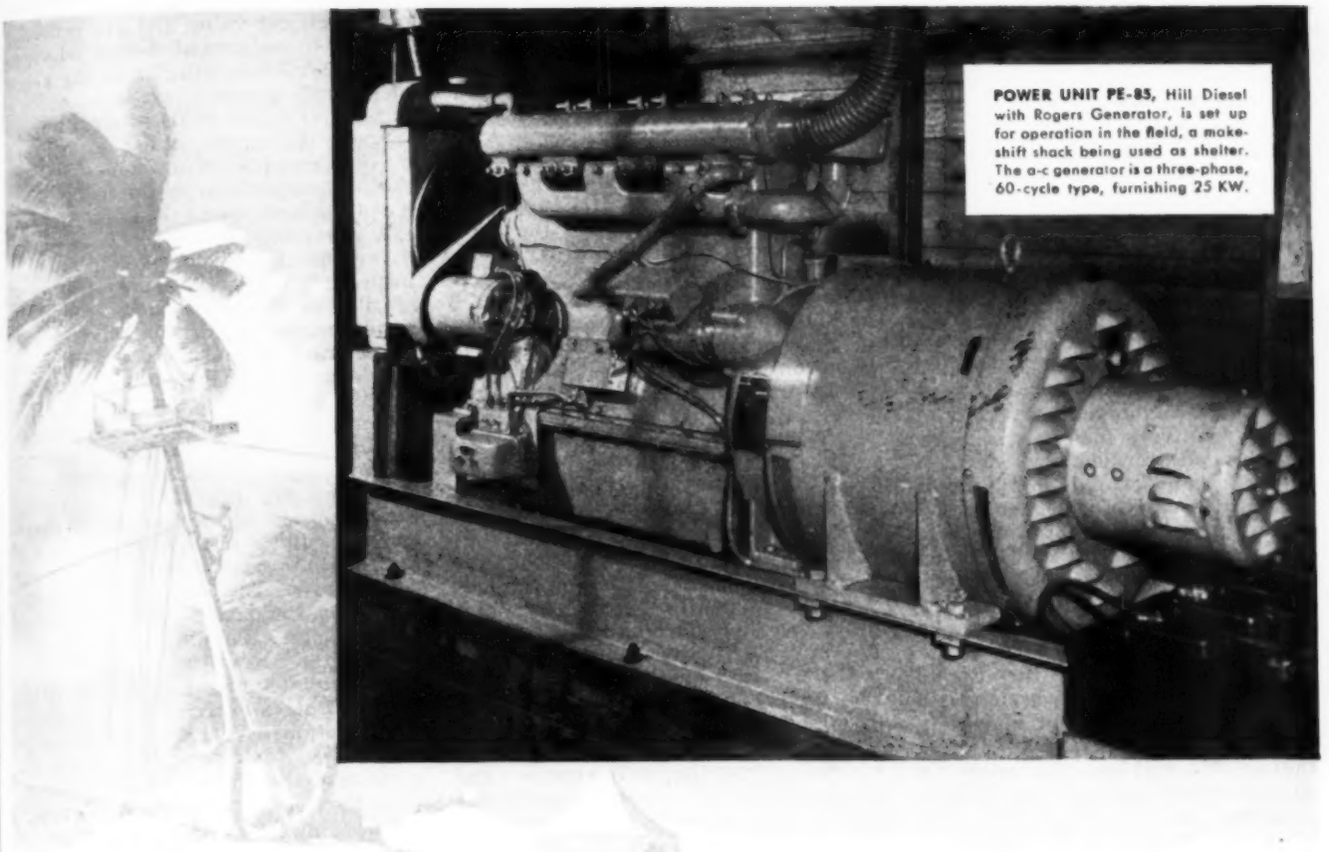
Signal Corps Ground Signal Agency, which includes those laboratories working on ground equipment. Although these two agencies do only a small part of the research and development work on Army electronic equipment, they are responsible for most development specifications; for the testing of development models; and for the preparation of specifications for most of the equipment prior to its being placed in production.

This war has so rapidly proved the practical military value of electronic devices of many types and such rapid strides have been made in the advancement of the electronic art that it has been necessary to put great emphasis on the exercise of economy in types of equipment, the selection of essential projects, the rejection of the non-essential, the standardization of equipment, and of component parts. Much supervision of this phase of development activities is required throughout the using forces and the Engineering and Technical Service. The Signal Corps Standards Agency is charged with the mission of accomplishing standardization of components; progress can be reported in the standardization of such components as vacuum tubes, meters, fixed capacitors, resistors, quartz crystals, and similar items.

One of the major difficulties experienced in the manufacture of electronic equipment has been the shortage of certain critical raw materials.

The Production Division of Army Service Forces, the Procurement and Distribution Service of the Signal Corps, the War Production Board and the Army-Navy Electronic Production Agency, having primary responsibility for this activity, have collaborated and accomplished great achievements in the expansion of needed facilities, and the supply of some items such as steatite insulators and quartz crystals is now entirely adequate to meet our needs. The mission of the Engineering and Technical Service is to assist these agencies through the development of suitable substitutes and the re-design of electronic equipment to utilize non-critical raw materials and substitute components. This substitution and re-design program has been one of the largest activities of the development agencies.

The problem of obtaining widespread substitution without sacrifice of performance or quality control is inevitably difficult. The accomplish-



POWER UNIT PE-85, Hill Diesel with Rogers Generator, is set up for operation in the field, a make-shift shack being used as shelter. The a-c generator is a three-phase, 60-cycle type, furnishing 25 KW.

Top: U. S. Signal Corps Official Photo – *Bottom:* Acme Newspictures, Inc.

"MORE POWER TO THE SIGNAL CORPS!"

Safe, dependable, Diesel Power The power unit shown above is typical of those being used by the Signal Corps and other branches of our Armed Forces to provide the necessary energy for this "electrical war". From units like this, telephone and other signal systems, radio communication, detection and control apparatus get their vital impulses...

When the big job is done, and the highly trained men of the Signal Corps turn again to peacetime pursuits, they will find Diesel Power units beside them again, operating with the kind of efficiency for which they are already famous.

Rogers Diesel and Aircraft Corporation, 1120 Leggett Avenue, New York 59, N.Y. *Divisions:* Hill Diesel Engine Company; Edwards Company; Edwards Aircraft Products, Inc.; Ideal Power Lawn Mower Company.

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ments in this field have been many and noteworthy. Much still remains to be done.

The Engineering and Technical Service collaborates with and furnishes engineering assistance to other Technical Services, such as, the Ordnance and the Materiel Command of the Army Air Forces; such services as coordinating the installation of radio and interphone equipment in trucks, tanks, and planes. One of the important engineering problems in both vehicles and aircraft is the design and testing of systems for shielding the ignition system or otherwise providing suppression of ignition interference which would render radio reception in vehicles relatively ineffective. Some research and considerable development has been devoted to this activity; a field agency is operated at Detroit for maintaining close coordination of this activity with the Ordnance Tank and Automotive center. The Signal Corps Aircraft Signal Agency provides the necessary coordination with the Army Air Forces.

The responsibility of the Signal Corps and of the Engineering and Technical Service does not end when the equipment has been developed, manufactured, and issued to troops. Of vital interest to engineers and designers are those crucial periods when new equipment is first used in quantity by the using Service; when it is first used in combat operations; each time it is employed in a new type of operation; and each time it is employed in a new theater of operation where different conditions of temperature range, humidity, rainfall, static, dust, and vegetation prevail. Reports received are sometimes contradictory. Some units report difficulty with their equipment, other units with the same equipment report results exceeding the most optimistic expectations. Under these circumstances a multitude of doubts assail the development organization. Was the equipment correctly installed and aligned? Was it operational trouble? Was the equipment employed in situations beyond its capabilities? Did performance deteriorate under the service conditions? If so, why did this not show up during service tests?

Thus, it is easy to understand the need which engineering and technical personnel feel, for closely following equipment during its early service life; for analyzing by personal observation the conditions of use and the hidden or unknown design factors which are responsible for unforeseen weaknesses.

Military and civilian technicians of the Signal Corps Engineering and Technical Service have been in several theaters of operation for the purpose of evaluating the performance and serviceability of signal equipment; also, to assist theater personnel in the introduction of new equipment and to study maintenance problems. The results of such experience gained by close association with troop units are of the utmost value and are reflected rapidly in equipment design which is more completely suitable to the needs of combat units.

Another factor of the utmost importance to the successful use of any kind of equipment is *maintenance*. From the first conception by the using Service of the need for a type of equipment, through every step of the research, development, service test, production, inspection, and service use—life cycle of equipment—maintenance planning, maintenance organization, and maintenance training, must be considered and provided for at every step. There are no commercial service stations or radio repair services that can be called upon by an Army in a foreign theater of operation—the Army must carry with it, in its every unit, the responsibility, the means and the know-how of maintenance. Large scale modern battle is a struggle to wear down and wear out the enemy. The efficiency of equipment maintenance is a factor which can measure the difference between victory and defeat.

The Maintenance Division of Army Service Forces exercises staff and policy direction over maintenance. The Chief Signal Officer and, under his command, the Engineering and Technical Service are responsible for supervision of maintenance of signal equipment and the formulation of signal maintenance policies in accord with the over-all principles and policies established by Army Service Forces

Congratulations U. S. SIGNAL CORPS
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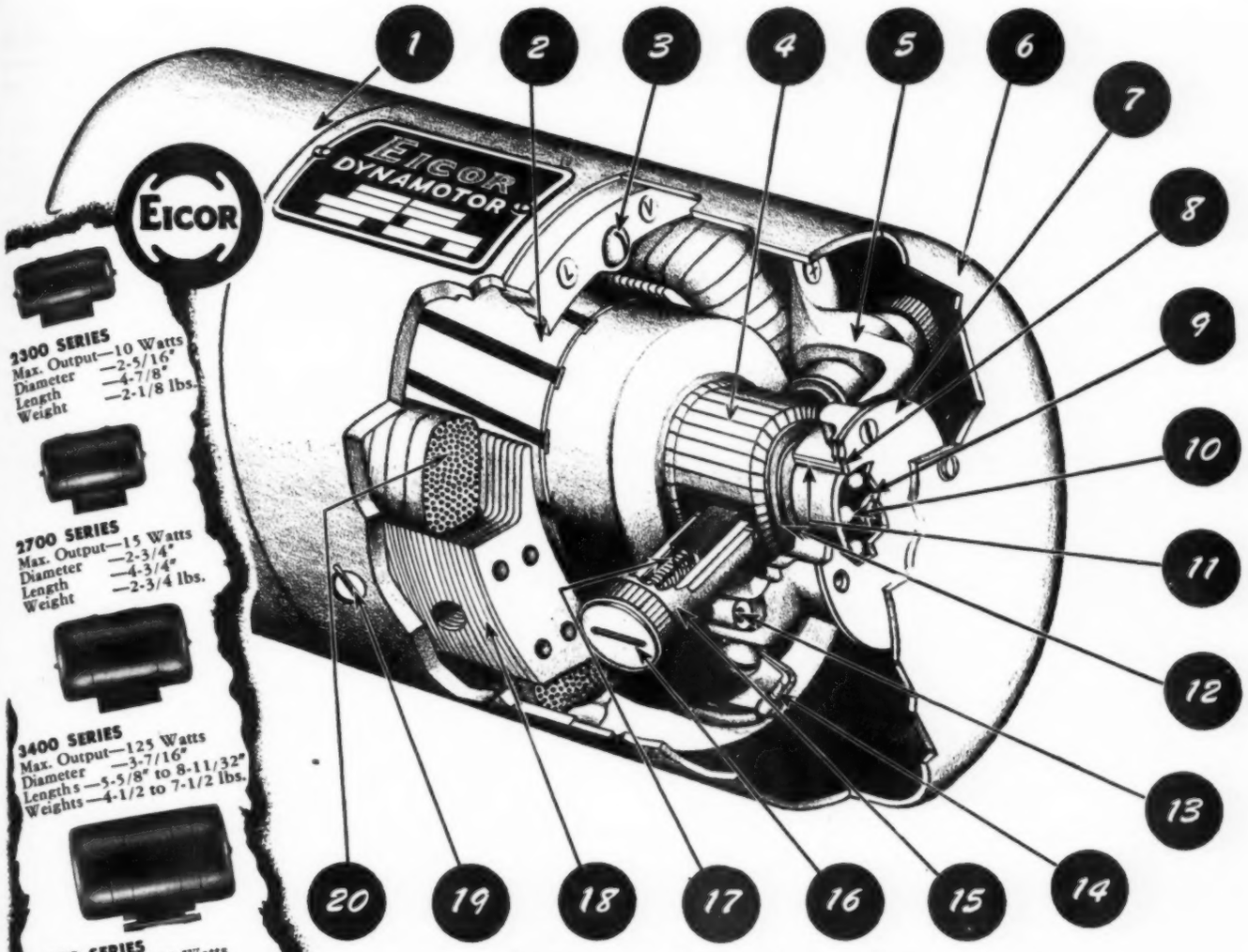
AT EVERY point of the globe, wherever the United Nations are in Battle Formation, whether in the air or on the sea, or on the land, you will find Grammes products, (Panels, Dials, Instruction Plates, etc.) on various types of Signal Corps Equipment.



THE leading Radio and Communication manufacturers such as Radio Corp. of America, Westinghouse Electric & Manufacturing Co., General Electric Co., Bendix Radio Corp., Western Electric Co., Inc., Stewart Warner Corp., Admiral Corp., Belmont Radio Corp., and many others all look to Grammes for their accessory requirements on their Signal Corps Contracts.

SERVICE, Quality and a determination to meet Contract Requirements insure these manufacturers of a 100% performance Record. For results be sure to consult Grammes on new Signal Corps requirements.

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Diameter —2-5/16"
Length —4-7/8"
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Max. Output—350 Watts
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Weights 17 to 21-1/2 lbs.

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Max. Output—500 Watts
Diameter —6-3/16"
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Isometric Cut-Away View of an

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3	Thru Bolt
4	Commutator
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6	End Cover
7	End Plate
8	Gasket
9	End Play Washer
10	Ball Bearings
11	Steel Insert
12	Oil Thrower Washer
13	Brush Holder Screw
14	Dynamotor Leads
15	Brush Holder
16	Brush Holder Cap
17	Brush and Spring
18	Field Poles
19	Field Pole Screw
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headquarters. This is accomplished by the Signal Corps Maintenance Agency at Philadelphia and the Maintenance Branch in Washington. These agencies are closely tied in with the development and specification activities of all Signal Corps laboratories to the end that efficient test and maintenance equipment shall be developed concurrently with the equipment to be maintained and that spare and maintenance parts kits and Depot maintenance parts shall be procured with the equipment issued concurrently to troops, and thereafter replenished at a rate consistent with the rate of consumption.

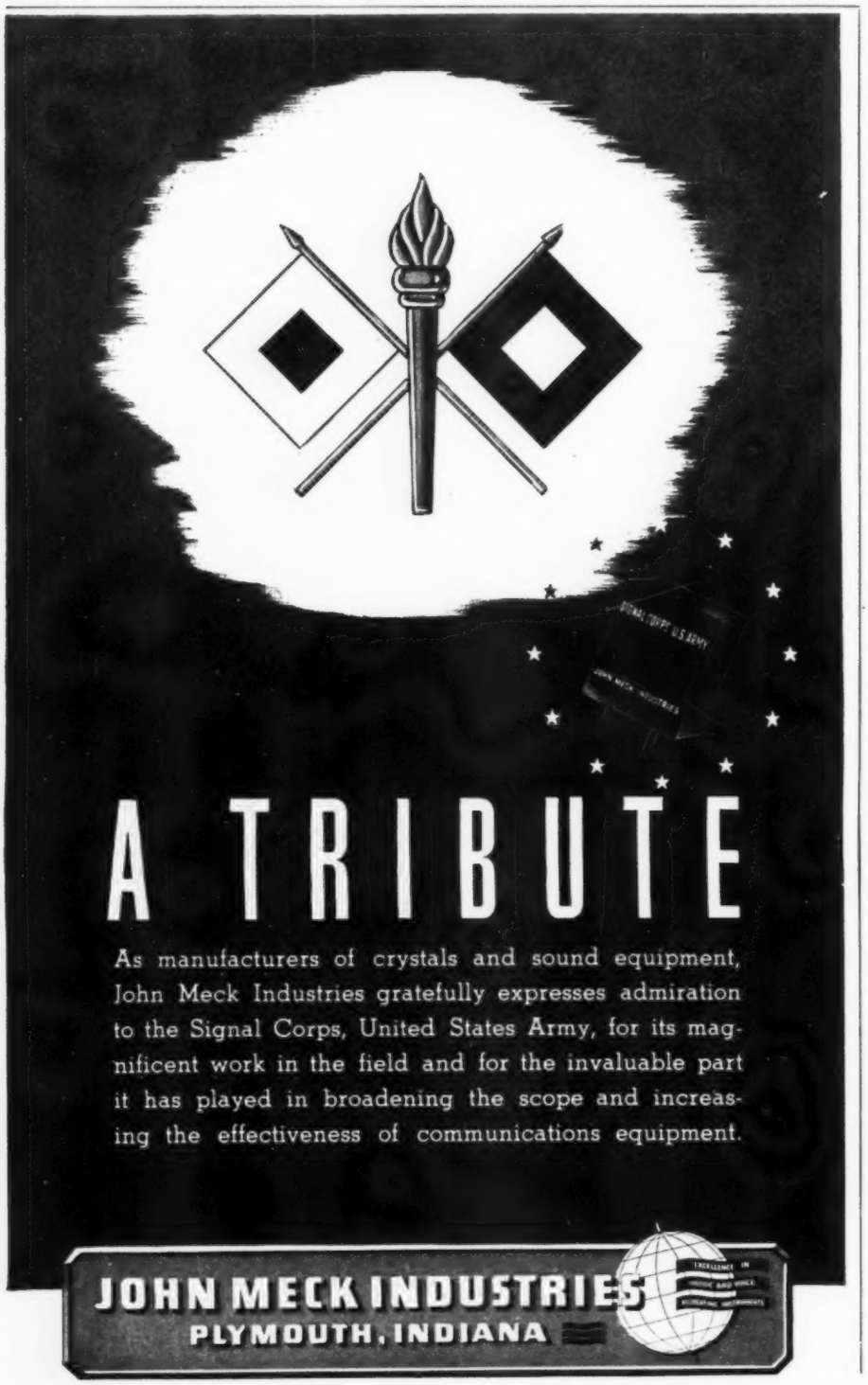
Unfortunately, from the standpoint of interesting reading, the most spectacular and important developments cannot be discussed. This necessarily deprives the public of information of many of the new techniques of warfare which increase the efficiency of our Armed Forces, disturb and confuse the plans and calculations of our enemies, and reduce our battle casualties.

Within our Armed Forces the experience gained in combat has caused an increased consciousness of the importance of signal communication and other technical aids in obtaining timing, coordination of effort within and between sea, air, and ground power, and the concentration of overwhelming fire power at the decisive place.

Faith in science and invention is an important element of the American philosophy. It is doubtful that this faith has ever been more adequately justified than by the record of achievement attained during this war in all its many branches by American, British, and Canadian scientists; physicists; engineers; the technical forces of draftsmen and highly skilled craftsmen who have implemented and contributed to their creations; and above all, by the fighting forces whose strategical and tactical applications of new techniques have demonstrated true genius.

At this time it does not appear possible to predict with reason the further duration of this war. But, regardless of its length, the results of the past two years form a reasonable basis for confidence that the technical and intellectual capabilities of The United Nations can find an effective answer to new weapons to which our enemies may resort.

—30—



Vehicular Radio

(*Continued from page* 211)

without the facilities of production line. The radio is installed.

This model gets the works. First at the Ordnance Proving Grounds it goes through all the automotive and ballistics tests. It's tried for stresses and strains, pickup and speed, fitted on railroad cars, such as will transport it, tried on bridges, such as it will be expected to cross, including pontoon bridges, subjected to the concussions of near-miss bombs and shells, and finally it is fired at point blank, strafed and bombed and blasted by artillery to determine just how much it will stand, where its weak points are, how strong is its armor, how long will it keep going.

All through the preliminary tests, the radio and interphone equipments are operated to see how they react. And when the grand destructive finale comes, the radio is turned on while Signal Corps engineers listen on remote receiving sets to learn how it behaves when a bomb is shaking the tank, when bullets are rattling on its steel skin, and when an armor-piercing shell is ricocheting crazily around its interior.

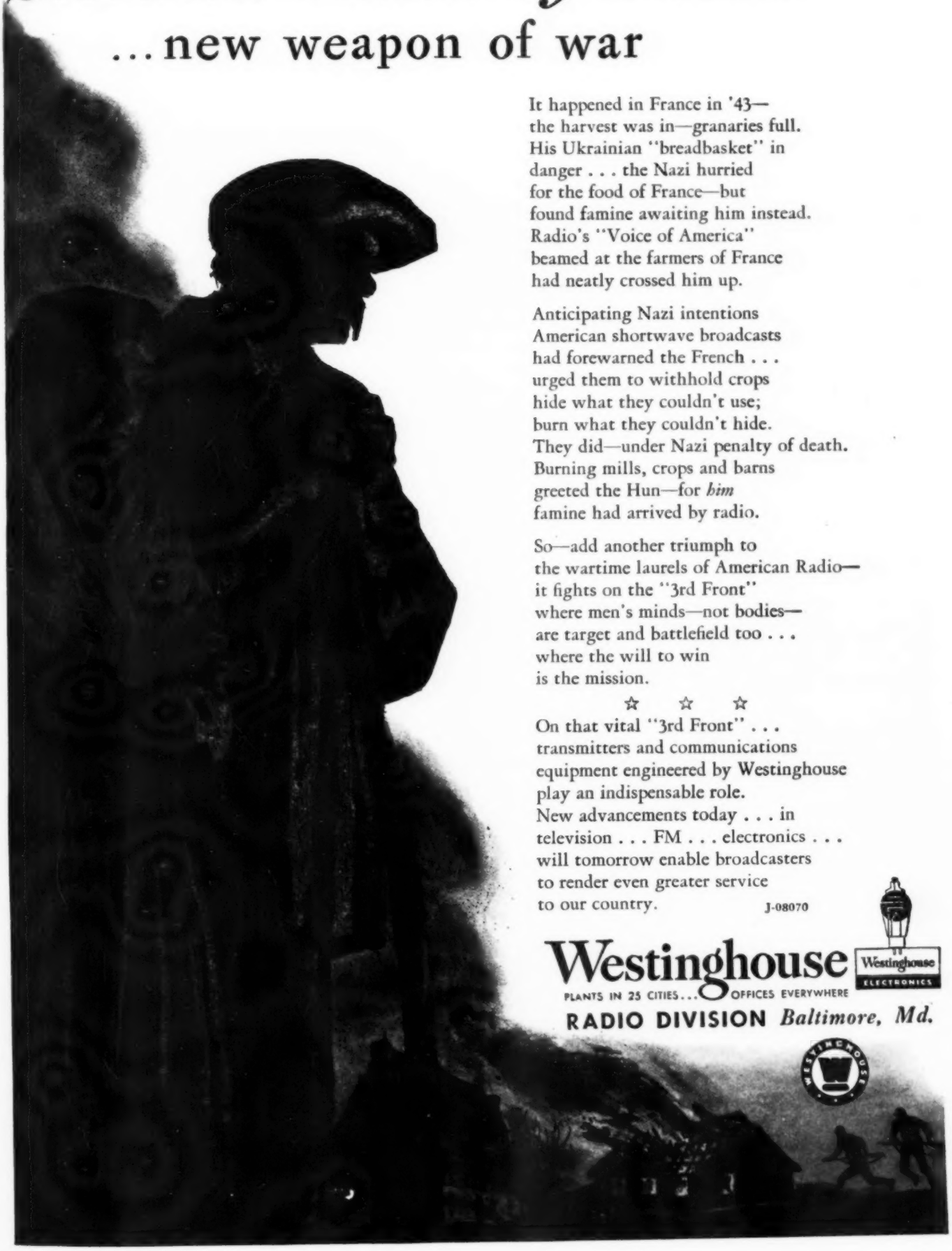
Does a connection jar loose? A tube go out? Frequency vary? After each test, the radio and the suppression system are carefully examined. For the price of a tank and a radio, with the tank's other special equipment, the engineers have learned lessons that may save many tanks and radios and many men's lives.

Next, one of the unfinished models, incorporating the improvements determined by Ordnance Department tests, is sent to the Armored Command Board and regular tank crews put it through its paces under all the conditions it is likely to meet in the hands of their comrades.

When all the bugs that have developed in all these tests have been ironed

"Scorched Earth" by Radio

...new weapon of war



It happened in France in '43—
the harvest was in—granaries full.
His Ukrainian "breadbasket" in
danger . . . the Nazi hurried
for the food of France—but
found famine awaiting him instead.
Radio's "Voice of America"
beamed at the farmers of France
had neatly crossed him up.

Anticipating Nazi intentions
American shortwave broadcasts
had forewarned the French . . .
urged them to withhold crops
hide what they couldn't use;
burn what they couldn't hide.
They did—under Nazi penalty of death.
Burning mills, crops and barns
greeted the Hun—for *him*
famine had arrived by radio.

So—add another triumph to
the wartime laurels of American Radio—
it fights on the "3rd Front"
where men's minds—not bodies—
are target and battlefield too . . .
where the will to win
is the mission.

☆ ☆ ☆

On that vital "3rd Front" . . .
transmitters and communications
equipment engineered by Westinghouse
play an indispensable role.
New advancements today . . . in
television . . . FM . . . electronics . . .
will tomorrow enable broadcasters
to render even greater service
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RADIO DIVISION *Baltimore, Md.*

out, tank and radio separately go into mass production. Inspectors closely follow not only the manufacture of the radio equipment but of the vehicles themselves. It often happens that during production someone will get an idea for a change that may put a fire extinguisher or an ammunition box in the place designed for the radio. Unless this were caught in time, a costly knot might be tied in synchronized lines of radio and vehicular production.

Production models of the radios and tanks are then sent to an Ordnance Tank Depot where the sets are installed in the tanks, together with all the other equipment required, ready for shipment to the Using Arms. When an order comes through for a vehicle to be "combat loaded" the depot readies it to the last turn of a bolt, even the ammunition cases are filled and the radios are tuned to perfection, so that the tank is ready to roll right off the ship into fighting action.

The Ordnance Tank Depot is a comparatively new departure in assembly practices that has been of untold benefit to troops in action. Under the old system, armored vehicles and radios were shipped separately to the field, where the troops themselves made the radio installations. That worked well under peacetime conditions when there was time for soldiers to experiment with the installations and benefit by the training that it gave them, and when standardization of combat vehicle installations was not of critical importance.

Commercial assembly experts frequently ask, "Why can't the sets be installed at the factory, as the automobile manufacturers used to install them with a couple of deft movements on the assembly lines?" In the first place, installation of military transmitters and receivers that will continue to function in a bucking, rolling, blast-wracked vehicle of war is a considerably more elaborate and technical procedure than buckling a little receiver into a passenger car. It would complicate the vehicle assembly lines for when an armored vehicle leaves the manufacturing plant, no one can say for sure where it is going. A few top Army officials may have a good idea, though those who handle the actual shipment do not because they are only told, at most, its next destination along the way. Even the Army officials who think they know the ultimate destination cannot be sure because late changes in the strategical situation may alter it. A tank originally intended for action in Italy might be rerouted to the Southwest Pacific if the successful conduct of the war demands it. Its final destination, when it is put aboard ship, is secret. Consequently, when that tank is at the factory, no one can say with certainty what type of radio equipment must go into it.

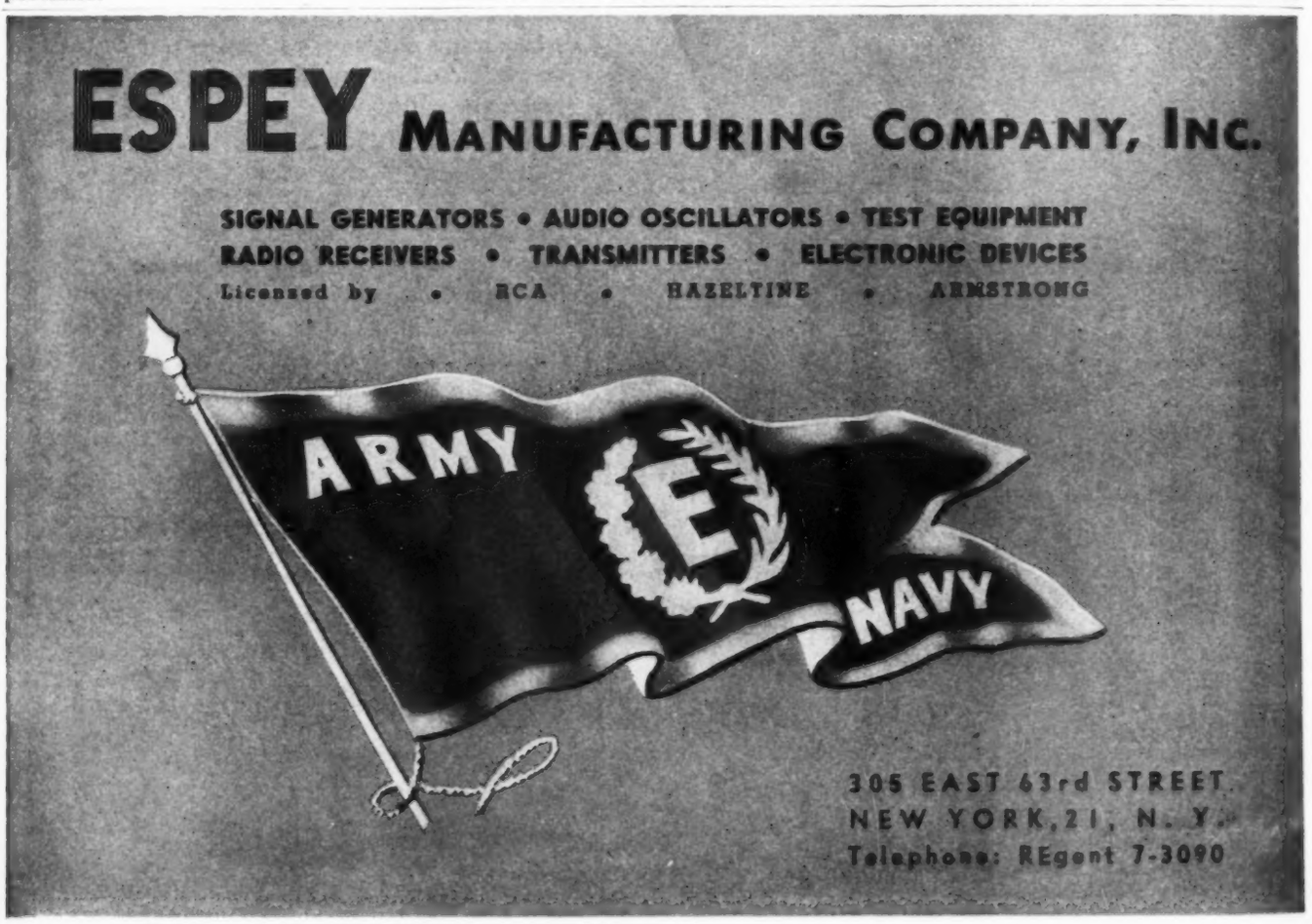
With a varied supply of both armored vehicles and radio equipment on hand, the tank depot is able to make the precise installation required at a moment's notice and has facilities for making special brackets or whatever changes are required to meet the needs of the particular combat theater. In the desert, sand shields are required; for amphibious warfare, waterproofing; for Arctic areas, protection from the cold.

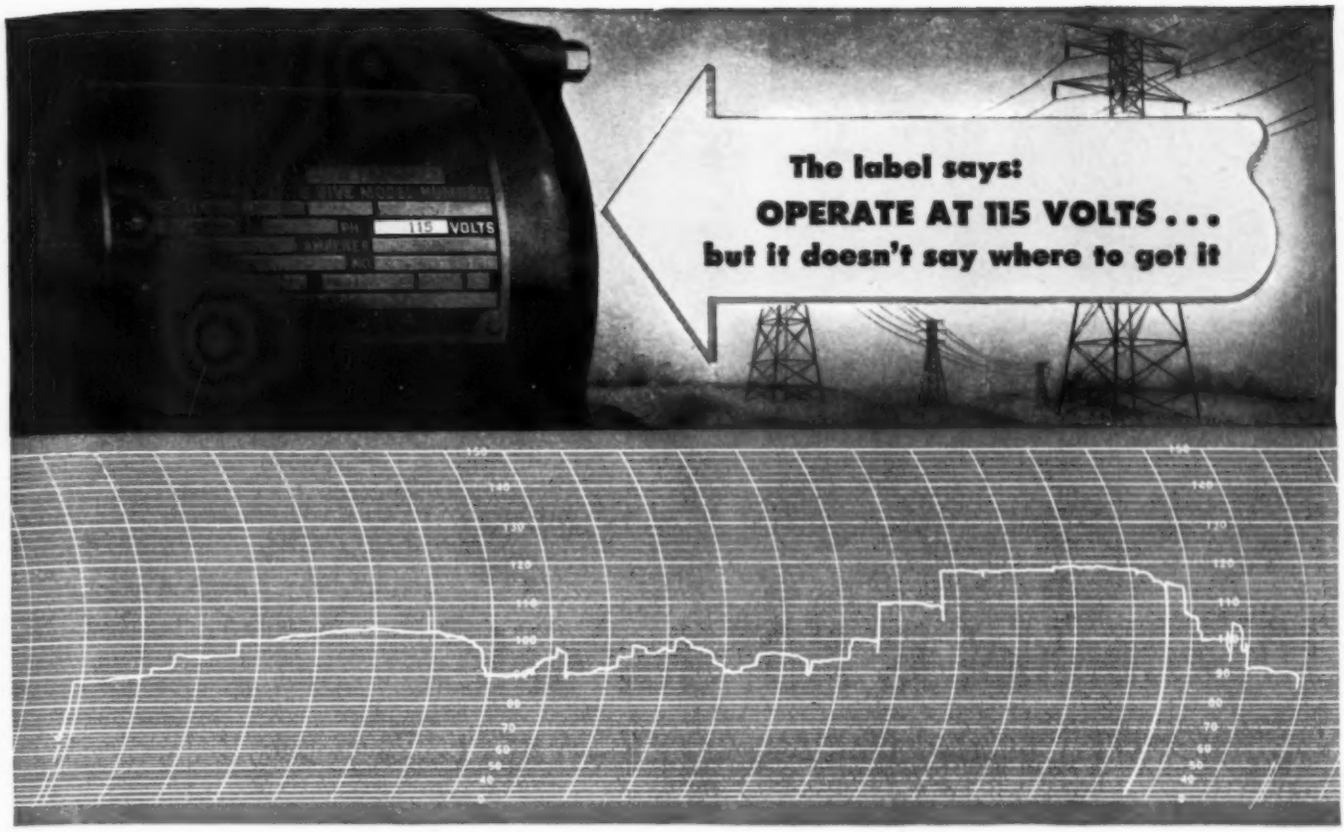
Tank depots are also used as vehicular modification centers. When combat experience discloses the need for a change in equipment, that change can be made at the depot as each set is installed, or before, while the factory turning out the equipment requires much more time to change over its production process. Thus, from the moment a modification is decided upon, it can be put into effect on materiel leaving the United States while the factories are changing over to accomplish it in mass production.

This system requires great stores of equipment at the depots, in order that there be a sufficiency on hand to meet any sudden demand from the theaters of operation. That is the answer to the questions that come to civilian minds when they see vast concentrations of vehicles and other equipment apparently idle around these depots while industry is being pushed to the utmost to produce more.

Communications equipment is installed at the Ordnance Tank Depots in armored vehicles only, that which include armored cars, tanks, gun motor carriages, scout cars, and halftracs.

An equally effective system has been worked out for installing communica-





RATED VOLTAGE is always available to equipment protected with built-in CONSTANT VOLTAGE

"Operate at 115 volts" on the label of electrically operated precision equipment is not simply informative —*it's a warning!*

A *warning* that the device is too sensitive to tolerate the voltage fluctuations that may be met on America's power lines, and still perform with efficiency. A *warning* that sensitive tubes and other delicate mechanisms may be irreparably damaged by line surges and that costly replacements, with consequent loss of time and efficiency, lie ahead.

The design engineer who assumes that the precisely controlled voltages of the research laboratory will be duplicated in the field is heading his product toward trouble. Nominal line voltage ratings can no longer be used as single, stable reference points for design considerations. Commercial power lines are too heavily loaded and unpredictable.

"Operate at 115 volts" is no longer sufficient on a label. A guarantee that the "115 volts" will always be available, in spite of the unpredictable fluctuations of commercial power, is a prime requisite if the device is to perform with unfailing efficiency and precision.

The place to provide voltage control is within the equipment. With a Constant Voltage Transformer as a component part, the device is provided with a dependable source of voltage and unfailing protection against performance interference and construction damage.

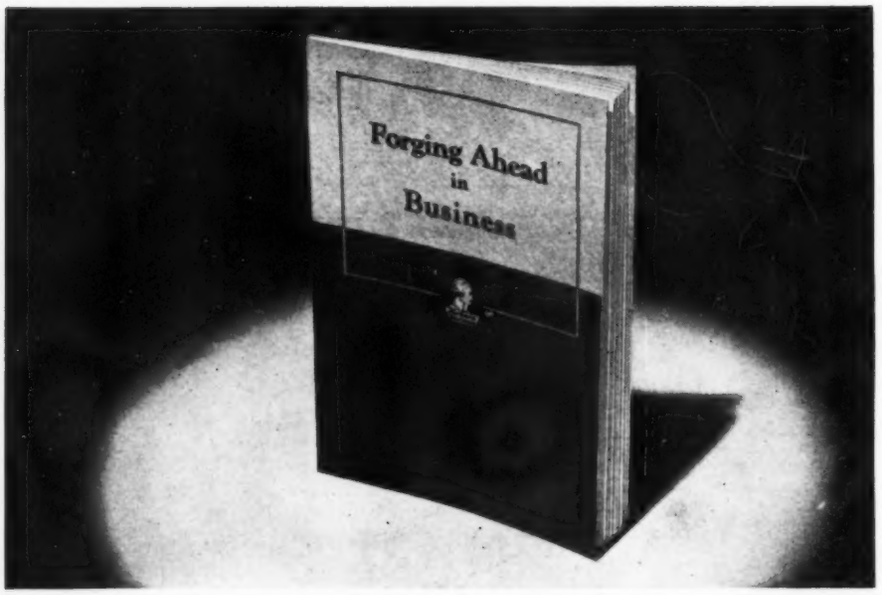
SOLA Constant Voltage Transformers are available in sizes and capacities to meet design requirements of any electrically operated equipment or electronic device. Items so protected will deliver as efficiently in the field as under the most ideal laboratory conditions.

SOLA Constant Voltage Transformers have no moving parts to get out of order. There are no manual adjustments to be made. They perform instantly and automatically, maintaining output constant to within ± 1% of the rated voltage, regardless of line fluctuations as great as 30%.

Constant Voltage Transformers

To Manufacturers:
Built-in voltage control guarantees the voltage called for on your label. Consult our engineers on details of design specifications.
Ask for Bulletin 2CV-7a

Transformers for: Constant Voltage • Cold Cathode Lighting • Mercury Lamps • Series Lighting • Fluorescent Lighting • X-Ray Equipment • Luminous Tube Signs Oil Burner Ignition • Radio • Power • Controls • Signal Systems • Door Bells and Chimes • etc. **SOLA ELECTRIC CO., 2525 Clybourn Ave., Chicago 14, Ill.**



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The story told in its 64 pages is especially valuable to technical men. It describes how they can acquire the one thing which most of them lack: a knowledge of *all* departments of business—the qualifications without which they cannot achieve top rank as industrial executives.

This book explains why technical men—engineers, chemists and metallurgists, production men and others—men already highly-trained in their own professions — need *additional* training in the fundamentals of business. Without this added knowledge they are likely to find themselves "frozen" at a certain level. Their services have a "ceiling" beyond which they cannot progress, while other men who understand marketing, finance and accounting as well as production, take over the executive jobs.

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tions in the unarmored vehicles. These installations are made in the field because the installation is much less complicated and since it is impossible to know until the vehicles reach their final destination which vehicles are to be radio equipped.

In every theater of operations and throughout the United States the using personnel, who have been trained in correct installation procedures, do the work; for it is they who must transfer the radio set from a vehicle that has become a battle casualty to its ready replacement.

Some idea of the jig-saw puzzle that vehicular radio represents in the intricate fighting machine that is the American Army can be gained from the fact that we are producing many models of vehicles and many types of standard radio sets that may be used individually or in combination in the various vehicles. The combination possibilities suggest a little problem in multiplication that gives the number of possible installations an astronomical tinge.

Yet radio transmitters and receivers alone are not the only types of communications equipment installed in vehicles. Plans have been perfected for a radio fascsimile set to supplement the regular radio in half-tracs. These, it has been found, can send and receive faster than the CW operator.

Development of Signal Corps radio equipment in the past year or so has been chiefly in the direction of greater universality: to simplify the maintenance problems and to permit use of each set under more varied conditions.

In the war's early, frantic production period, the manufacturers were permitted to virtually set their own specifications because the prime object was to get radio equipment into the field. Now, as the Signal Corps has been able to benefit from the experience gained from the use of its equipment under actual battle conditions and perfect designs, it is able to effect greater standardization, and as a result, more interchangeability.

Recently put in service is a half-wave doublet antenna, to replace the vehicular whip antenna, when a set is being operated as a fixed station, causing it to radiate more power and consequently, have greater range.

The power supply for vehicular radio sets has been simplified by more extensive use of vibrators. They are easier to manufacture and maintain and reduce requirements for such critical items as ball bearings, and release manufacturing facilities for armatures and similar products.

The throat microphone, which proved lacking in articulation response when used in high ambient noise levels, is being replaced by the lip microphone, which is supported from the ears like a pair of spectacles and sits on the upper lip like a moustache, leaving the hands free. Incidentally, a moustache does not interfere with its operation. Nor does a gas mask.

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The Messages Are Getting Through!

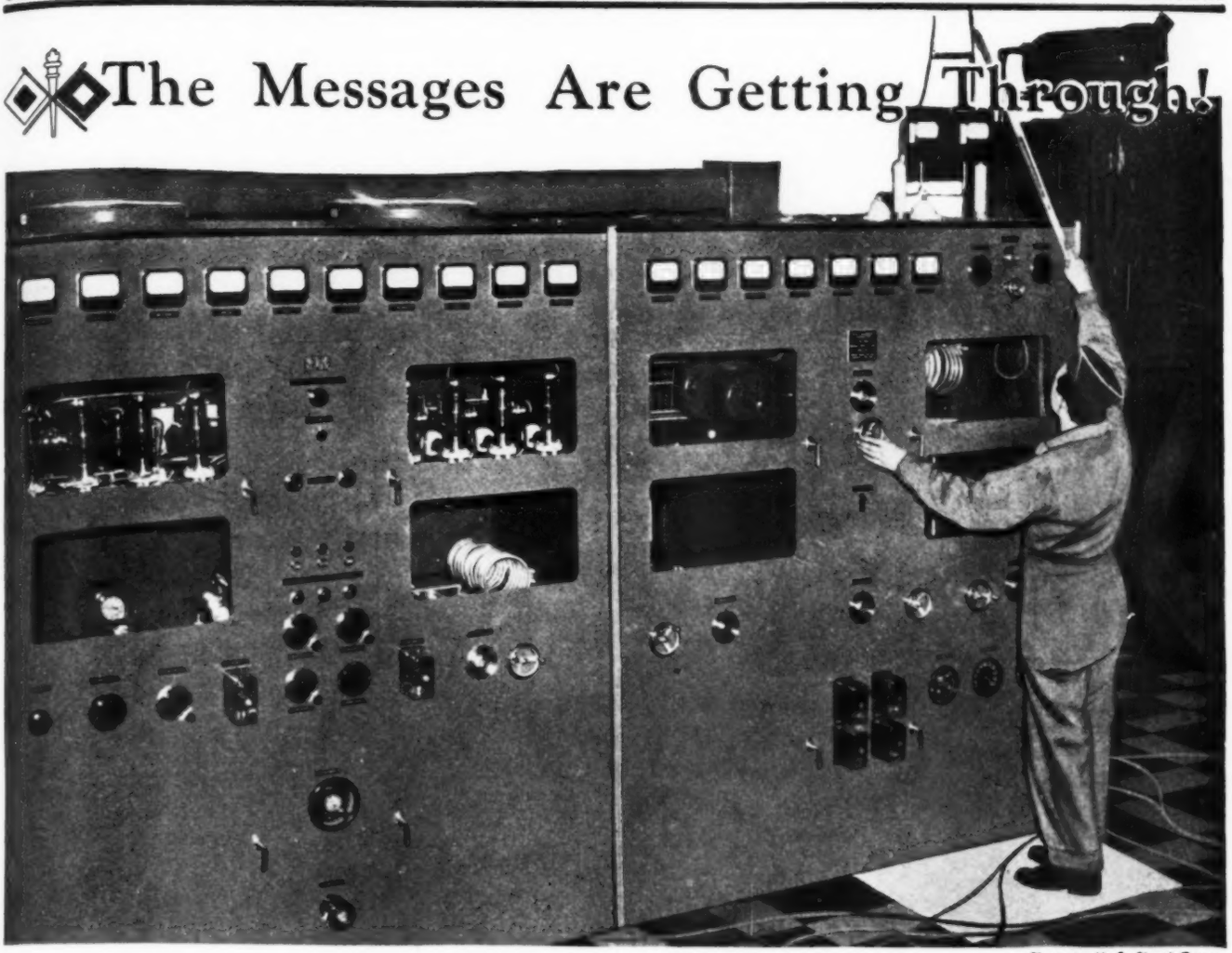


Photo by U. S. Signal Corps

A Signal Corps Sergeant checks over a Press Wireless 40 KW transmitter at a Signal Corps radio station in North Africa. Transmitters like this are the "backbone" of the Army Communications Service in the field.

Messages of United States Signal Corps over its far-flung Communications System totals more words per month than those of all other communications companies combined. A large share of this radio traffic is handled with equipment designed and manufactured by Press Wireless, Inc.

This equipment is a part of the primary installation at most of the headquarters of major theaters of operation, the backbone of the Army Communications Service network in handling communications to our troops in the field all over the world.

Press Wireless, Inc. is proud to be serving the Signal Corps as a principal supplier of apparatus which is proving so vital to victory. We salute the gallant men of the Corps who will continue to get the messages through until this war is won!



Awarded to Our Hicksville Long Island Plant for Outstanding Achievement in War Production

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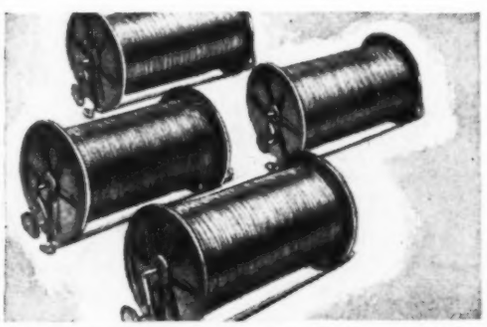
Miles from nowhere —but the message gets through

He'd crawled, run, crawled again. Now he was far ahead of his company... into enemy territory... surrounded... cut off completely from American forces except for a strand of lightweight wire... Laytex Assault Wire.

But his messages got through surely and clearly... made possible a successful advance.

Laytex Assault Wire is made expressly for jobs like this. It's extremely lightweight... yet tough enough to be used by advance scouts.

The use of such lightweight small diameter wire is possible only because the insulation is of such high quality—has high resistance to moisture, withstands a wide range of temperature changes and does not become embrittled when subjected to vibration and shock. Laytex Assault Wire has a talking distance of over five miles.



LIGHTWEIGHT Laytex Assault Wire weighs only thirty pounds per mile. This means that an advance scout can carry ample wire while pushing ahead.



SPECIALLY DEVELOPED for front line service, Laytex Assault Wire is hard at work in Europe, Asia, the South Pacific.



LAYTEX ASSAULT WIRE is unaffected by moisture or temperature changes because of the high quality of the insulation. This means it can be laid and used successfully regardless of climate or terrain.



FIVE MILES LONG—but messages get through clearly. Laytex Assault Wire, tested and retested for quality, has a proven talking distance of more than five miles.

RUBBER COMPANY

Military radio development today is a far-cry from the tedious progress of peacetime. Then, when orders were so small that manufacturers were loathe to take an Army job with its meticulous specifications, a new idea in radio required six years to design, perfect, produce, and distribute, where today, with the entire radio industry working for the Armed Forces, the most far-reaching experiments are carried to successful conclusion, into production, and into the hands of troops in a very much shorter time.

It is to be noted that over a two-year period the uninterrupted and rapid manufacture of billions of dollars worth of electronic equipment is being done by an industry whose total annual peacetime capacity was approximately three hundred million dollars.

Unfortunately, the problem involves other elements which are more difficult and more serious than is indicated by the comparison of dollar value. Of the annual 300 million dollar peacetime capacity of this industry, only about 5 per cent (or 15 million dollars) involved the type of precision manufacture of sturdy, high-quality equipment of advanced design, and of such high performance as to demand the maximum capabilities of the electronic arts and sciences. The major part of the electronic war program involves equipment of this type.

The rapid pace of technological research and development in this war continues to place a premium on the speed with which new devices, with hitherto unattainable performance, can be put into mass production. In no field has this need been greater than in electronics; and a very large share of our production difficulties are due to the realization of the need for producing new devices and the consequent initiation of such production, long before it would be attempted under normal circumstances. This condition can be expected to last throughout the war.

—30—

Meteorology

(*Continued from page* 206)

and techniques are being developed which will aid in the conduct of this war and will prove to be of inestimable value to humanity when peace returns. The network of weather stations established throughout the world will make flying easier and safer and will furnish more accurate information for special storms, floods, frosts, fires, and other weather forecasts of value to civilians.

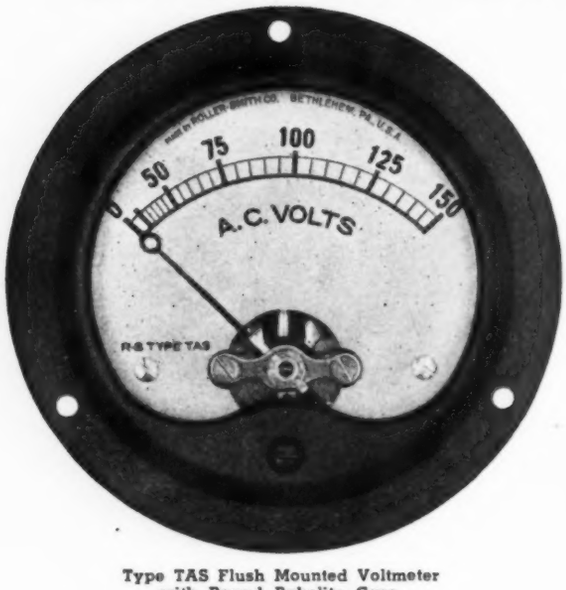
A glance at the map will indicate that the Allied Nations are in an excellent position to use the weather, or rather the knowledge of forthcoming weather, to good advantage in their conduct of the war. Remember that the forecaster needs exact information concerning weather conditions over large areas to make correct long range forecasts, and also remember that, in general, weather moves from west to east. Germany and Japan control relatively small areas of land and sea so their meteorologists are badly handicapped in their attempts to forecast. Germany is in a particularly unfortunate position in this respect since almost no weather information is available to her from the Atlantic Ocean and storms reach the continent without much advance warning. While it is believed that the Germans were able to forecast the dry period in September, 1939, at which time their mechanized forces invaded Poland, it is probable that such excellent forecasts can no longer be made due to the dearth of meteorological information available. The Japanese are somewhat more favorably situated with respect to areas from which weather information is available, but their inability to obtain data from Siberia, Central China, India, and the Indian Ocean, and the loss of their weather stations in the Aleutians must be a serious handicap to their forecasters.

In the past, weather forecasting has been largely an art learned by the painful method of trial and error but, with the improvement in weather equipment and the development of new and improved methods of forecasting, it is rapidly becoming a true science based upon the known laws of physics and mathematics.

—30—

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Roller-Smith ammeters and voltmeters are of the repulsion iron-vane type, using low loss iron, proportioned to give highest accuracy, permanency and low burdens. Their sturdy bridge construction also contributes to permanency of calibration and enables the instruments to withstand shocks and hard usage.

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Switchboards • Metal Enclosed Switchgear • Electrical Instruments
Indoor and Outdoor Oil Circuit Breakers • Air Circuit Breakers

WHEN THE U. S. ARMY SIGNAL CORPS SAYS *Hello!* FROM TOKYO...



The saga of the Signal Corps born on war battlefields, and bred in a wealth of research, conducted in both peace and war times, results in constantly improved equipment for war and should mean better communication tomorrow. For many of the Signal Corps' developments *will* be applicable to peacetime use. Similarly, many of the U. S. Army Signal Corps supply manufacturers can apply the fruits of their *own* research to the production of civilian goods. We, too, will follow this pattern . . . but only after we hear the first *friendly* "Hello!" from Tokyo.

Hudson American

CORPORATION

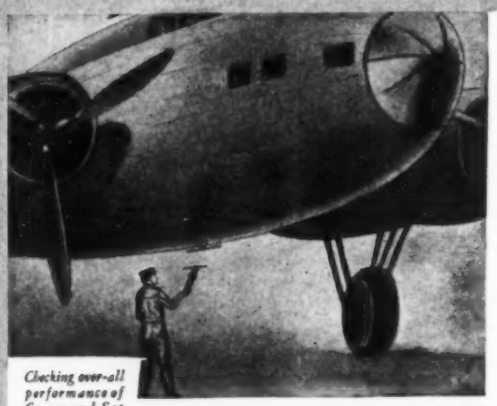
Manufacturers of Electronic and Radio Devices

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ERCO RADIO EQUIPMENT

used wherever dependable performance counts

ERCO research and engineering have contributed many of the advanced refinements that have brought radio communications control to its present high efficiency. And the exacting ERCO standards in manufacture have always demanded no compromise with quality. This broad knowledge and experience are available to you in the solution of your particular problems. Your inquiry invited.

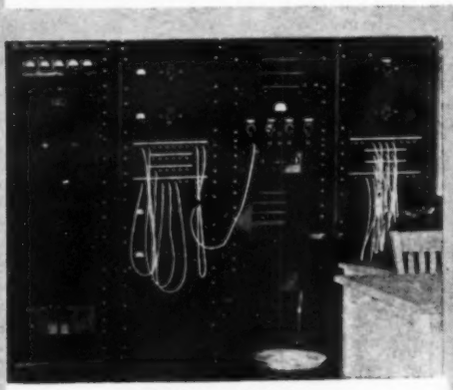


Checking over-all performance of Command Set Transmitter



ERCO MW-60 RESONANCE METER

TELLS INSTANTLY whether you are getting maximum efficiency from UHF equipment. A dependable, sensitive, rectifier type vacuum tube voltmeter indicator for accurate checking of transmitter performance in the 120 to 600 MC range. Ideal for maintaining peak efficiency of Absolute Altimeters, Blind Landing Markers, Glide Path Markers, Airport Traffic Control, Weather Teletype, and Broadcast Relay Circuits.



ERCO RADIO COMMUNICATION EQUIPMENT

Meets the exacting demands required for Airport Traffic Control. Used by Grumman Aircraft, Republic Aviation, and other prominent users of airport control equipment.



ERCO RADIO RECEIVER

Designed for communication or pick up where a high degree of stability and selectivity are necessary. Used at Pan American Airways Systems' air bases; by U.S. Signal Corps, Socony-Vacuum, and others for: Police, Marine, and general communications.

ERCO RADIO LABORATORIES, Inc.

HEMPSTEAD, NEW YORK

Manufacturers of CUSTOM BUILT RADIO APPARATUS

Crystals for S.C. Sets

(*Continued from page 202*)

not only rotates the set's variable gang condenser to a new and pre-set position, but also connects the tank circuit to another crystal on that pre-set frequency.

And when a fighter pilot, hightailing toward an enemy target, finishes talking to the control office at his base, he merely pushes a button in order to change his channel so he can talk to his squadron commander up ahead of him. This, like the tank radio described above, changes the circuit to another crystal.

Thus has the quartz crystal gone to war.

On a dozen battlefronts, where swift communications may so easily spell the difference between smooth success and a costly setback, messages take to their allotted portion of the air on wave-lengths accurately monitored by these little crystals of quartz.

And in theaters of operation ranging from icy Adak in the Aleutians to the steaming jungles of Burma, Signal Corps radio sets retain their frequency stability under temperatures from 40 degrees below zero to 130 above and humidities from zero to 100, thanks again to the remarkable physical properties of a correctly cut crystal.

These Signal Corps handie-talkies, guidon sets, and tank push-button sets —and they are not the only ones that use crystals—are issued to our troops by the many thousands. They are mass production jobs. So, too, must be the crystal units that keep them in tune.

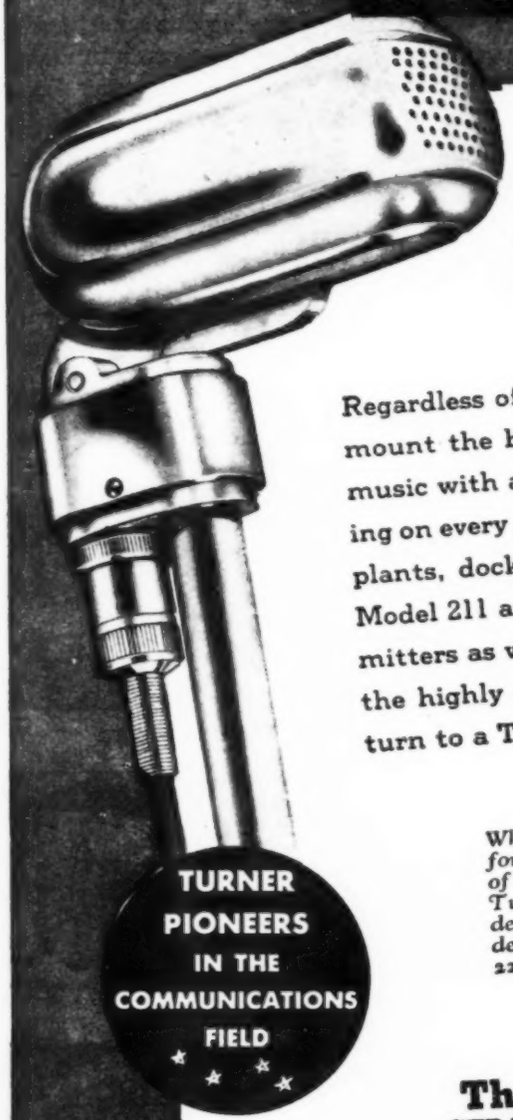
Yet most radio amateurs will remember, that only a few years ago, a processed tuning crystal was a fairly expensive item. The market for crystals was a limited one and production was conducted on a small scale by a few processors. The annual production was numbered by a few thousand units. Today it is numbered far into the *millions*—almost entirely the result of military requirements.

More than two years ago, it became apparent to Signal Corps radio engineers that the production of quartz crystals must be tremendously expanded if the advantages of instant push-button tuning, without laborious adjustments, were to be provided to our troops in situations where the loss of a split second may mean the difference between life and death for the operator.

Accordingly, a special group of quartz crystal authorities was established in the Office of the Chief Signal Officer, at the headquarters of Army Service Forces in Washington, to study and correlate all data on the subject. An experimental quartz crystal testing and processing plant was established in one of the Signal Corps laboratories under the jurisdiction of the Signal Corps Ground Signal Agency. Development as well as pro-

Dependability Unlimited

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SOUND ENGINEERING

Permits faithful reproduction of all sounds, from the faintest whisper to the loudest train whistle, when you use a Turner Microphone.

Regardless of acoustic or climatic conditions, you can surmount the barriers of distance with clear, crisp speech or music with a Turner. Today, Turner Microphones are serving on every war front — in war plants, air dromes, ordnance plants, docks, army camps, in broadcast studios (for which Model 211 at left is specifically engineered), in police transmitters as well as public address systems of every type. For the highly sensitive transmission, where accuracy is vital, turn to a Turner.

Whatever your need for a Microphone, for indoor or outdoor use, you can be sure of complete satisfaction when you specify Turner. Ruggedly constructed in modern design, Turner Mikes stand up and deliver under toughest usage. (Model 22 D Dynamic and 22X Crystal at right).



TURNER PIONEERS IN THE COMMUNICATIONS FIELD

The TURNER Company
CEDAR RAPIDS, IOWA, U.S.A.

Crystals Licensed Under Patents of The Brush Development Company

Free TURNER catalog Write today for yours. Gives full details on all available mike, and how to care for them you may own.



WHY FRUEHAUF TRAILERS WENT TO WAR!

BEFORE THE WAR, more than 100 different lines of business learned by experience that Truck-Trailers do most difficult hauling jobs better than trucks alone . . and usually more economically, too. They proved their adaptability to a wide variety of tasks, many of which couldn't be handled at all by any other method.

So, when Fruehauf Trailers went to war—and almost every one we're building in our seven plants today goes to war—it was because they could be quickly fitted into literally scores of new and difficult jobs.

For instance, the Fruehauf Trailer pictured above is a Field Staff Office headquarters on wheels. Nothing else could do the job as well.

The other Trailers illustrated here represent only a few of the various types now serving our armed forces. Further, most of the body types have several military applications. All the way from quartermaster depots to the battle lines, Trailers are carrying the goods with which we'll win the war.

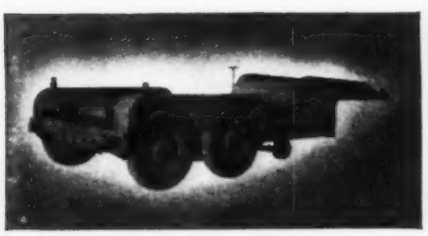
And at home, of course, Fruehauf Trailers are helping to keep the production lines running and to keep the workers clothed and fed and on the job.

★ ★ ★

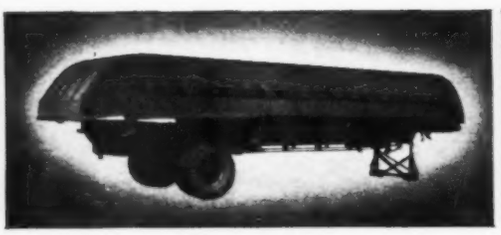
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Service In All Principal Cities



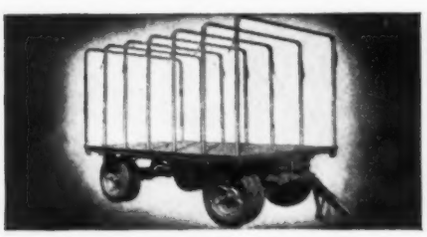
TRACTOR CARRIER



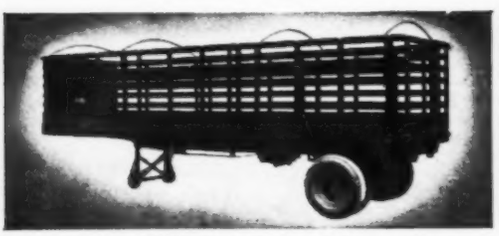
PONTON CARRIER



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EQUIPPED WITH SPECIAL KEYBOARD AND TYPE-FACE, THOUSANDS OF THESE REMINGTON RAND MODEL 17 TYPEWRITERS ARE IN ACTIVE USE BY THE U.S. SIGNAL CORPS ALL OVER THE WORLD. HERE, A COMPLETELY NEW MACHINE FROM BASE TO PLATEN, IS THE FINEST TYPEWRITER THAT MODERN ENGINEERING SKILL CAN DEVISE.

HOW NATURAL WHEN SPECIAL DEVELOPMENTS OF THIS KIND ARE NEEDED, TO TURN TO REMINGTON RAND, WORLD'S MOST EXPERIENCED MAKER OF FINE TYPEWRITERS.

Actual size photograph of the keyboard and typewritten message from the new Remington Rand Model 17.

Remington Rand

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Want Complete Blackout and Fully Illuminated Jewel?

NEW efficiency has been designed and built into the new No. 85 DRAKE Shutter Type Assembly! Now, for the first time, a 90 degree clockwise turn made easy by a sure-grip knurl, brings COMPLETE blackout . . . a 90 degree counter clockwise turn FULLY illuminates jewel. (Same rotation as aircorps part #42B3593). This new No. 85 is, we believe, the ONLY Shutter Type Assembly without a central pilot hole that permits light leakage. A firmly locking, slip-fit bezel is instantly removable without tools, for easy lamp replacement. It has the same general specifications and is interchangeable with our No. 80 Polaroid Type Assembly.

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OF ELECTRONIC TUBE TUNGSTEN LEADS,

BASES, CAPS, METAL SPECIALTIES AND

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The Engineering Company's technical staff—with over 20 years experience in this field—is fully capable of providing a solution to any pertinent problem. Close tolerances, extreme temperatures, corrosion etc., are every day routine.

The Daniel Kondakjian high efficiency spot welder offers increased production possibilities worthy of rapid consideration. For over 20 years a leader. Inquiries invited.

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duction contracts were issued to industrial firms having some experience in the field. At the same time a Signal Corps officer, attached as communications adviser on the U. S. Military Mission to Brazil, was put on the trail of raw material sources.

Chemically, quartz is silicon dioxide —a combination of silicon and oxygen, which are the two chemical elements most abundant in the crust of the earth. Quartz may be found in almost every part of the globe, but only a small proportion of the crystals are good enough for processing into tuning units and to date the most abundant source of raw material, from a commercial standpoint, has been Brazil.

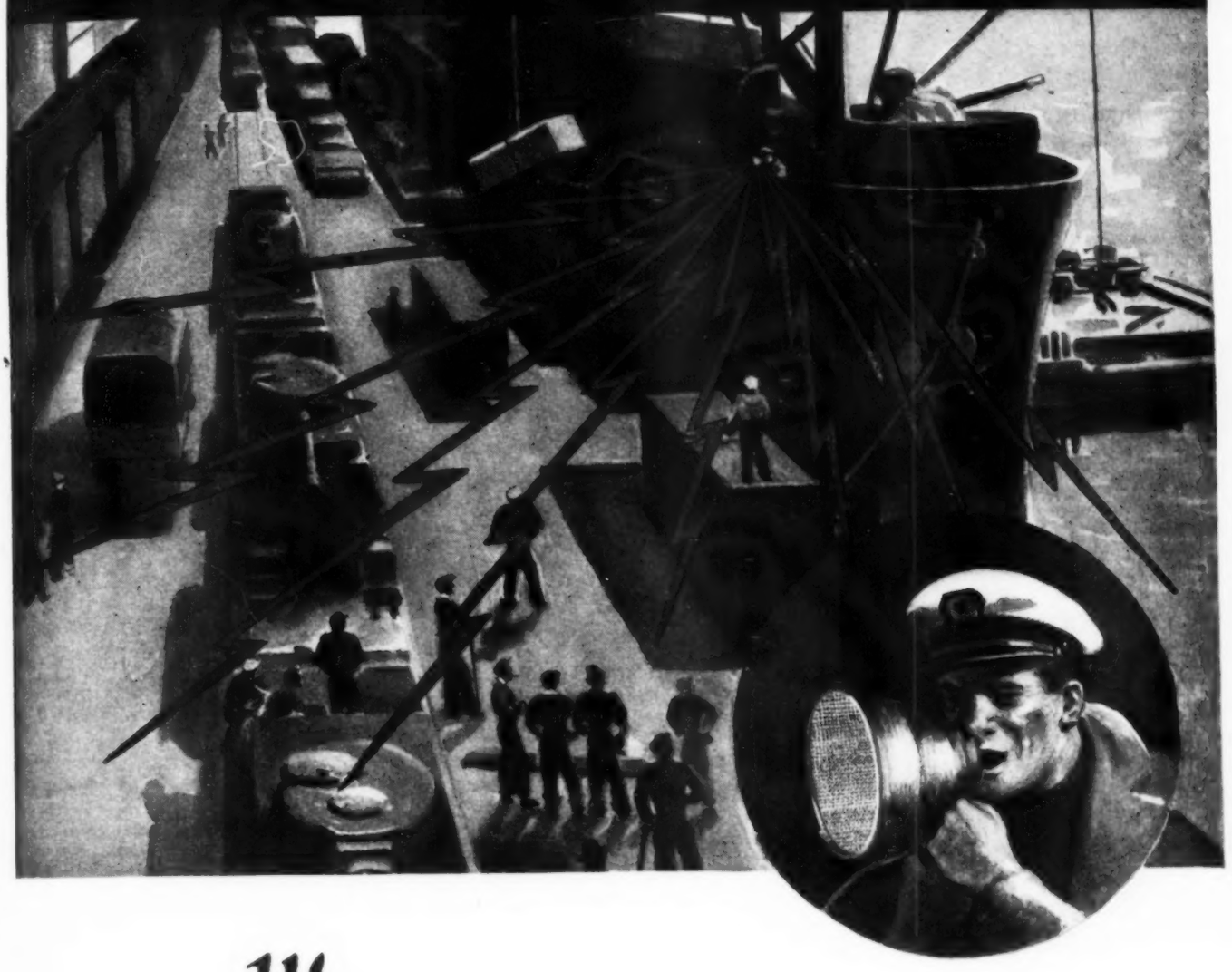
The piezo-electric effect, which is the essence of the quartz crystal's value to radio, was discovered a little over sixty years ago by the French physicist, Pierre Curie, and his brother. Pierre Curie, it will be recalled, was, with his Polish wife, Marie, the co-discoverer of radium. The prefix "piezo" means pressure. The Curies discovered that, if a quartz crystal were subjected to pressure by putting a weight on it, the surfaces of the crystal would develop an electric charge. The more pressure, the more voltage.

In the science of electricity, we expect that if a certain phenomenon occurs, the opposite effect should occur as well. For instance, electricity in motion creates a magnetic field and, in turn, a magnetic field in motion generates electric current. Or again, if an antenna transmits radio waves, it will also receive them. So scientists realized almost immediately, after Curie's original discovery, that the reverse effect could be expected; namely, that if an electric voltage were applied to a quartz crystal, it would show a mechanical strain. Pierre Curie confirmed that by experiment.

One more scientific fact is needed—the fact that a section of quartz crystal, like any other elastic object, will tend to vibrate mechanically at a certain natural frequency depending on its size, shape, and internal structure. Thus, any section of quartz will have its mechanical resonant frequency. Couple it into an electrical circuit by means of the piezo-electric effect, and this natural mechanical frequency may be made to control the electrical tank circuit of a radio oscillator.

Piezo-electric crystals were applied in the First World War to generate mechanical vibrations at supersonic frequency. A submarine detector of this type, employing quartz plates, was developed by the French Professor Langevin of Paris at the request of the French Government. It was not perfected in time to apply it against the German U-boats during that war, but in the postwar years, this type of vibration generator served in the fathometers protecting ships from going aground by the reception of echoes from supersonic vibrations sent from a ship to the sea-bottom.

ADD POWERS TO YOUR VOICE...

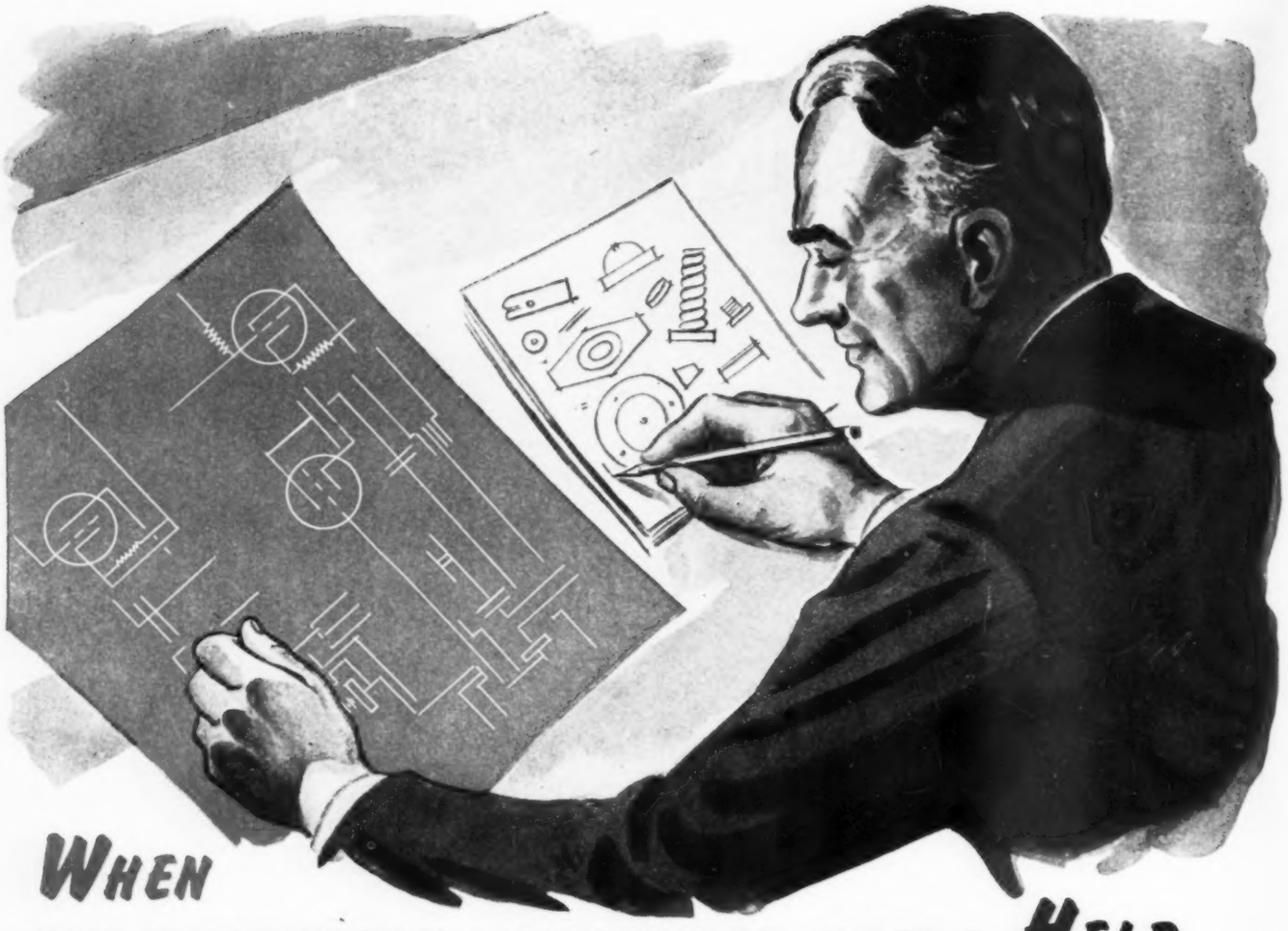


Whatever the use, time, or place, your orders are more effective if your *actual* voice is heard—instead of being replaced by signals or mechanical reproductions. Retention of the personal touch through use of Powers Electronic Megaphones means more authority, less chance of error, and instant transmission.

POWERS

ELECTRONIC AND COMMUNICATION COMPANY

GLEN COVE · NEW YORK



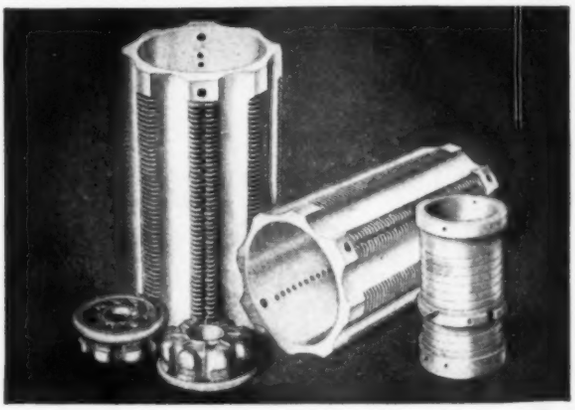
WHEN THE ELECTRONIC ENGINEER NEEDS HELP...

General Ceramics is at his beck and call to help with his insulator problems. In nine cases out of ten the solution will be STEATITE.

Electronic Engineers know that there is a very sound reason for the extensive demands made on the Steatite Industry, demands that are clearly portrayed by the almost astronomical increase in the production of Steatite insulators since 1938 (see graph).

During the course of this unprecedented progress, General Ceramics has been in the foreground both in regard to increased productive capacity and engineering skill in the development of new methods and products — meeting the strict specifications of the United States Army and Navy for the best and only the best in Steatite insulators.





For all your insulator problems whether specialized or standard, our Engineering Department is always at your service.

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FIRST Protection
of all ELECTRICAL CIRCUITS
INSTRUMENTS and EQUIPMENT
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Best Known Products in this Field are

LITTELFUSES

Mechanical depolarization against severe shock and vibration—the Locked Cap Assembly—non-crystallizing construction, are among the outstanding factors of Littelfuse fuse dependability:



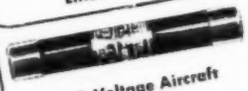
Instrument Littelfuse — 1/200 amp. to 15 amps. For galvanometers and other delicate instruments—radio tubes, testers, radio amplifier tubes, Radio "B" circuits, signal meters, thermocouples, etc.



3 A G Littelfuse — 1/16 to 20 amps., 250 to 500 V., for radios, amplifiers, auto-radios, fractional h.p. motors, magnets, power supplies, rectifiers, plate circuits, etc. Ratings to 8 amp., 250 V., Underwriters Approved.



3 A G Slo-Blo Littelfuse — 1/100 to 1 amp., 250 V., for applications requiring high time lag. For control circuits, magnets, vibrators, relays, interrupters, radios, amplifiers, etc.



High Voltage Aircraft Radio Littelfuse — 1,000, 2,500 and 3,000 V., 1/16 to 2 amps., 3", 4½" and 5½" long. Designed to clear circuits on power supplies up to 2 K.W. rating.



Heavy Duty Hi-Amp Anti-Vibration Littelfuse — 40 to 150 amps., 25 V., for battery circuits. Up to 125 V., on power supplies below 50 KVA. Small, light, 1¾" standard length. 1½" for ratings up to 100 amps. Transparent body for easy inspection.



Army Air Corps Spec. 94-32084 — Functions only on extreme overloads or short circuits. For all aircraft motor circuits and general protection. 1 to 300 amps., 125 V. Fibre-enclosed.



Army Air Corps Spec. 94-32271 — ¶ to 20 amps., 25 to 250 V. Blows in 30 min. at 125% of rating. For general protection. Glass-enclosed.



4 A G Anti-Vibration Aircraft Type — 1 to 60 amps., 25 to 250 V. Withstands extreme vibration. 1¼" x 13/32" dia. Glass-enclosed. Locked cap assembly, mechanically depolarized, non-crystallizing elements.



4 A B Anti-Vibration Aircraft Type — 1 to 60 amps., 25 to 250 V. 1¼" x 13/32" dia. Bakelite-enclosed for severest conditions. Locked cap assembly. Littelfuse features as above.



5 A G Anti-Vibration Aircraft Type — 1 to 60 amps., 25 to 250 V. 1½" x 13/32" dia. Glass enclosed. Locked cap assembly. Littelfuse features as above.



5 A B Anti-Vibration Aircraft Type — 1 to 60 amps., 25 to 250 V. 1½" x 13/32" dia. Bakelite enclosed. Locked cap assembly. Littelfuse features as above.

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Welded side terminals proof against heat and vibration. Terminal and shell in effect one piece. Bakelite body. Thorough insulation. Positive fuse grip. Full visual shock-proof inspection. Maximum strength and conductivity.



No. 1087 Instrument Fuse Mounting 1" x ¼" Dia. — For meters and delicate instruments, Radio "B" circuits, thermocouples, test equipment, small rectifier and power tubes, etc. Screwdriver and finger operated.



Littelfuse Silver-Plated Beryllium Copper Fuse Clips — Silver-plated at no extra cost. Highest electrical and thermal conductivity. Lowest resistivity. Great fatigue resistance. Ask for special bulletin.



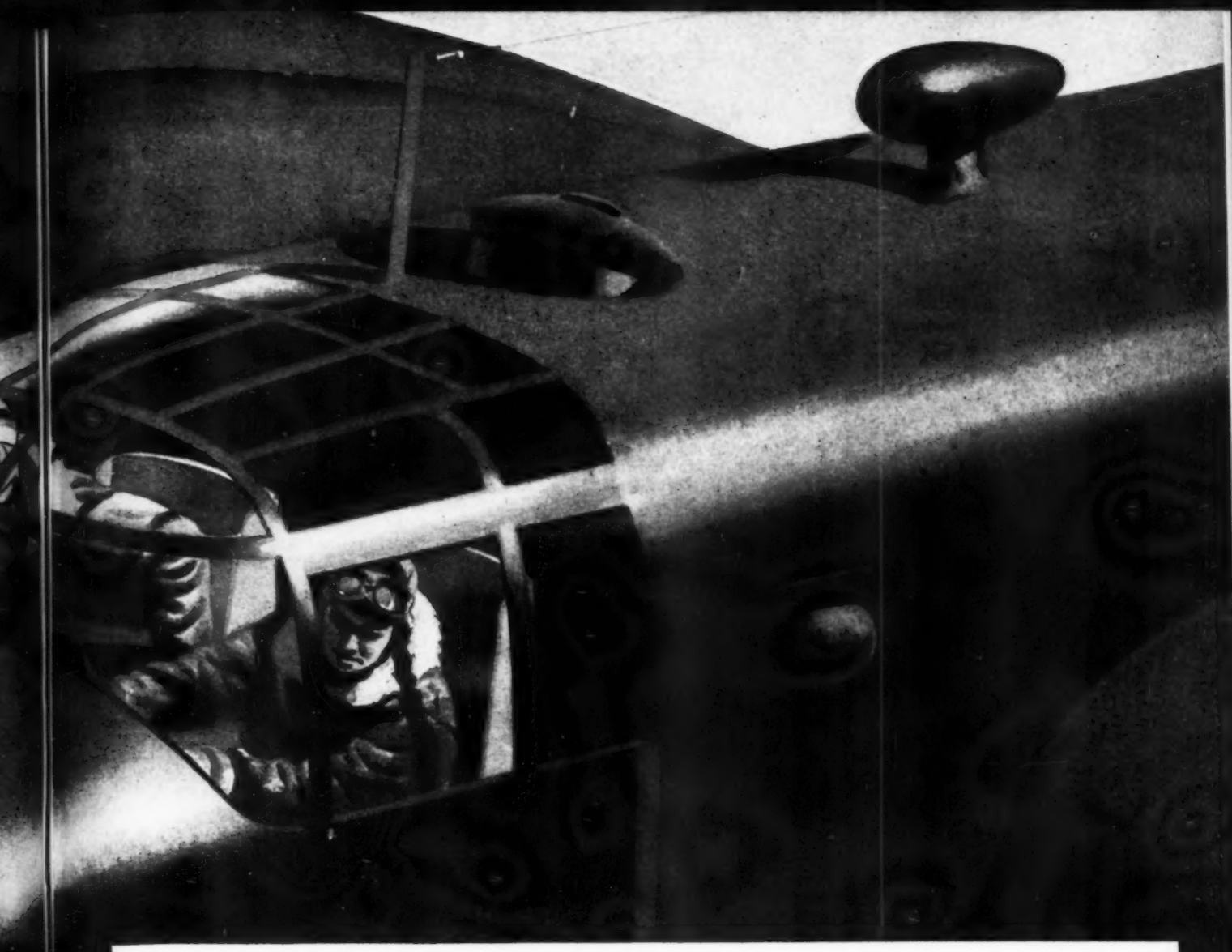
No. 1075 Mounting for 3 A G Fuses 1¼" x ¼" Dia. — For radios, auto-radios, amplifiers, fractional h.p. motors, magnets, control circuits, relays, rectifiers, plate circuits, etc. Screwdriver and finger operated.

For detail on fuses of high and low voltage for any instrument purpose —Clips—Mountings—Panels—Signal Indicators, etc. write

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"FIVE ZEROS AT TWELVE O'CLOCK!"



SEPARATED BY EIGHT FEET OF BLANKETING NOISE...PILOT AND GUNNER ARE MILES APART BY EAR

THROUGH THROAT MICROPHONES, signals between the pilot and gunner and the entire crew are just as clear as those in the football huddles back home. Throat microphones are but one of the several types being supplied to the U.S. Army Signal Corps by the Universal Microphone Co., Ltd.

Just as the throat microphone fills a specific requirement in aircraft, other Universal microphones of U.S. Army Signal Corps Specification are being manufactured for specific use in tanks, mobile, and field equipment – all doing their part to "get the message through".

Supplementing Signal Corps Microphone production, Universal manufactures Signal Corps Plugs, Jacks, and Switches for use in conjunction with voice communication equipment in trainers, inter-communication, and all-purpose transmitter work.



MODEL T-3Q-S *Throat Microphone now available to priority users through local radio jobbers. Catalogue No. 961 contains full description.*

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RED HOT VALUES in RADIO PARTS!



Combination Table Cabinet

Modern table type phono cabinet, highly finished walnut. Dimensions: 14" front to back, 16" side to side, 5½" bottom of table panel to top, height over all, 13".
In original cartons—while they last..... **$7.95**

67½ V. B. BATTERY
4" L. x 1¼" D. x 2½" W. to replace Min-Max of same size.
$1.85 each



7½ V. C. BATTERY
4" W. x 2¾" H. x ¾" D.
39c each
10 for $3.50



2 CELL 1½" V. A. BATTERY
Heavy Duty
3¾" H. x 1" D. x 1¾" W.
35c each. 10 for $3.00



40,000—New, First Quality Discs Recording Type—Paper Base



HIGH-QUALITY, double faced recording discs. Uniformly coated to mirror-smoothness. Non-inflammable. Made of durable paper-bond base. Low surface noise.

While They Last	Diam.	Quantity	Net
	8"	10 in Pkge.	$1.45
	10"	10 in Pkge.	1.75

SERVICEMEN'S SPECIAL!—10 lbs. Radio Parts Kit. Consists of all usable radio parts.....**only $2.95**

FREE! Servicemen write today for free catalog listing thousands of parts bargains . hardware and replacement parts.

We Save You Money
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RANDOLPH RADIO
603 WEST RANDOLPH ST., CHICAGO, 6, ILL.
"Millions of Parts for Millions of Radios"

In 1921, Professor W. G. Cady of Wesleyan University showed that quartz crystals could be used to create highly stable radio oscillators and that they could be arranged in such a way as to obtain exceedingly sharp frequency discrimination. Further improvements were made by Professor George Washington Pierce of Harvard and, in recent years, numerous investigators at many laboratories, particularly under the pressure of wartime need, have contributed a vast fund of knowledge to the nature of piezo-electric vibrations and their harnessing for the purpose of stabilizing the frequency of a radio set. So accurate can these crystal-controlled circuits be made that they are used for the timing of master clocks. Special applications in the field of supersonics and in carrier telephone filters have contributed to the development of the art.

The greatest concentration of research and development on crystal processing, however, has resulted directly from the current requirements of military radio communication. The development of manufacturing facilities and methods as a consequence of this need will no doubt be reflected in numerous postwar electronic devices aside from communication.

The property of piezo-electricity, like the beautifully symmetrical forms that crystals take, results from the internal molecular structure of the mineral. Numerous crystals of minerals other than quartz share this property. Among them, Rochelle salt crystals exhibit a very strong piezo-electric effect. However, from the commercial standpoint and, with due regard to such highly pertinent factors as manufacturing processes, availability of raw material and ruggedness in service, quartz has met the test and emerged as the most widely used material for the purpose at the present stage of our technological development.

The application of piezo-electricity to military communication, therefore, has centered around quartz—the discovery of sources for raw crystals, arrangements for their mining, purchase, and shipment to American processing plants, methods of inspection to select suitable crystals for processing and to determine their internal molecular structure, and a series of processes for cutting, grinding, lapping, finishing, testing, and mounting the oscillator plates to form units which could be incorporated in a radio set meeting rigid military specifications.

While, as has been said earlier, quartz in one form or another may be found in most parts of the world, only a small percentage of it is sufficiently pure and free from structural defects to provide suitable radio oscillator plates. There are well-known quartz crystal deposits in the United States, for example, in the region of Hot Springs, Arkansas, but the most intensive exploitation of crystal resources has occurred in another of the United Nations—Brazil. Prior to the entrance of the United States in the war, there was a considerable trade in raw quartz crystals picked up or mined in the less accessible parts of Brazil by a fraternity of pick-and-shovel prospectors known as "garimpeiros." The translucent stones which they put on the market constituted the most available source for the oscillator-plate industry. This source, for raw quartz crystals, will no doubt be extended in the postwar period.

In the first expansion of our quartz processing industry, quartz crystals available on the Brazilian market were shipped by high priority transportation to the United States where those suitable for processing were selected.

This met an urgent immediate need but much valuable shipping space was subsequently saved by the establishment of Signal Corps inspection laboratories in Rio de Janeiro and other Brazilian centers. This and other improvements at the source were brought about largely through the efforts of *Colonel Herbert G. Messer*, who had been assigned to Brazil as a member of the U. S. Military Mission and as adviser on communications matters to the Brazilian Air Ministry. Colonel Messer stayed on to make a survey of the Brazilian quartz industry and to recommend operating procedures which have increased production and eliminated waste. On his return to Washington, Colonel Messer became Chief of the Quartz Crystal Section in the Office of the Chief Signal Officer, Army Service Forces. He is now serving as Chief of the Ground Signal Equipment Branch of the Engineering and Technical Service, of which the Quartz Crystal Section is a part.

Meanwhile the Quartz Crystal Section, through a technical staff numbering some of the world's outstanding authorities on piezo-electric phenomena and applications, had initiated a far-reaching program designed to convert this nation's small and laboratory-scale crystal processing industry to one capable of handling mass production and producing a superior finished oscillator plate.

This technical staff consisted of a nucleus of Signal Corps officers and civilian scientists, a number of them with Ph.D. degrees in physics and allied fields. They worked closely with their colleagues in the Signal Corps laboratories, the Naval Research Laboratory and in a number of private industrial firms, which either had been engaged in crystal processing on a small scale before the war or had entered the field to help meet the need for crystal plates in military communication equipment.

The Quartz Crystal Section, Engineering and Technical Service of the Office of the Chief Signal Officer, is headed by Major Allyn Swinnerton, former professor of geology at Antioch College. The production and distribution of these millions of crystals



61% SAVING

in critical material for STAINLESS STEEL INSTRUMENT SCREWS



Here is a typical example of the methods "National" has devised to save time, materials, man power and machines.

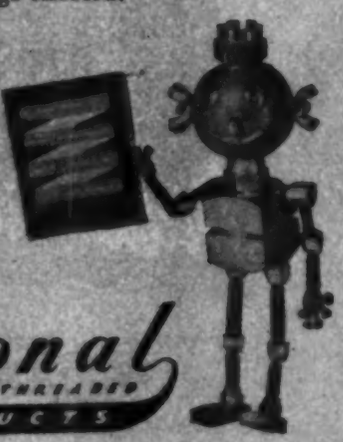
Formerly, instrument screws were made milled from bar, with cut threads. They are precision parts, full machine finished, with class 3 threads, a closer tolerance than that of commercial screws.

"National" developed a method of manufacture from wire of smaller diameter . . . upsetting the head, machining the blank on noncritical equipment and rolling the thread.

This effected a saving of 61 per cent in stainless steel containing highly critical chrome and nickel, and released a large number of automatic screw machines vitally needed for other purposes.

More than 55 instrument manufacturers have been highly satisfied with the quality of these screws and the savings effected.

This booklet contains 15 brief stories of important savings on bolts, nuts and special parts. Send for a copy of "SAVINGS."



National
HEADED AND THREADED PRODUCTS

THE NATIONAL SCREW & MFG. CO., CLEVELAND, O.

has been a terrific task excellently handled by Capt. E. W. Johnson, who has been a member of this Section since its start.

Much credit is also due Dr. Karl S. Van Dyke, one of America's leading experts on crystallography, for the present technical excellence of U. S. quartz crystal units.

One of the early problems was to obtain crystal processing machinery; for some of the processes involved, such as lapping, the only machinery available was that designed for optical equipment. Arrangements were made for Federal financing of facilities to manufacture the machinery needed for the manufacture of oscillator plates. This was the case, for example, in connection with X-ray machines used for inspection of the transparent crystals to determine their invisible internal structure.

Another major contribution of the Signal Corps Technical Staff was to consolidate the scattered items of technical "know how" that were available to various laboratories and manufacturers in different parts of the country. The technical men representing the Chief Signal Officer visited the plants and obtained the permission of virtually every important manufacturer to report his special technical processes into a common pool of information which was in turn put at the disposal of the entire industry to meet the national need. Handbooks and blueprints were prepared and technical specialists provided consultation and assistance to Signal Corps suppliers who asked for guidance.

Methods of examining and cutting quartz crystals are based on a knowledge of their fundamental structure. The typical shape of a quartz crystal, as produced by nature, is that of a hexagonal prism, longer than it is wide, and coming to a point at one or both ends in six-sided pyramids. Such a prism would, therefore, have six flat faces. This external structure results, of course, from the invisible internal arrangement of the atoms of oxygen and silicon that constitute the mineral. However, a good fraction of the "mother quartz," which is the industry's raw material, is of the "unfaced" variety. That is, although the invisible atomic structure is the same, the external structure has disappeared, perhaps—as in the case of a lump of quartz picked up in a riverbed—as the result of erosion. "Faced" quartz has the advantage that it betrays its internal structure and, therefore, expedites processing, since the wafers must be cut at certain angles to the natural axes of the crystal. However, "unfaced" quartz is also an important raw material and by special devices, using polarized light or X-rays, its internal axes can be discovered.

The X-ray goniometer is a very important tool in the determination of crystal orientation. It consists of an X-ray machine to generate the X-rays, and an ionization chamber to indicate when reflected rays are received, together with a method of mounting the crystal so that the angle of diffraction can be measured. To this "X-ray-eye," even an unfaced crystal exhibits the invisible structural arrangement of its atoms and indicates directly how the crystal should be mounted in the saw to cut it in one of the specified directions. Both the X-ray tube and the ionization chamber, with its amplifier, are electronic equipment.

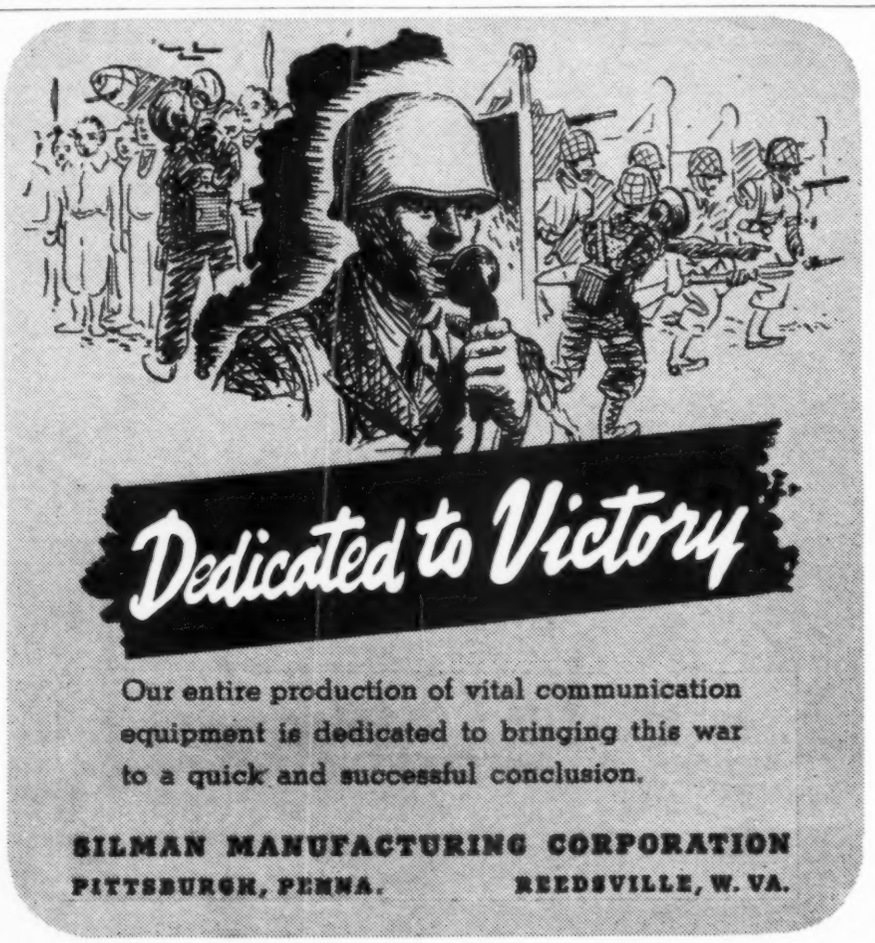
Raw quartz crystals imported from Brazil by the Metals Reserve Corporation are inspected by the National Bureau of Standards and by certain Signal Corps laboratories prior to their sale to the American industry. Inspection by means of polarized light reveals flaws which frequently make an apparently perfect crystal unsuitable for the manufacture of oscillator plates. The most common flaw is known as twinning and results from unlike internal arrangement of the atoms in different parts of the crystal. Other defects, such as cracks and bubbles, may be seen in ordinary light. Some apparent flaws which appear under optical examination have been found, as the result of research, not to impair the electrical qualities and specifications have been rewritten by the Signal Corps to permit their use, thus, in effect, expanding our available supply of raw materials.

Even if only a small part of a quartz crystal is free from flaws, it may be worth while cutting it, discarding the bad sections in the process. Some quartz which was formerly regarded as scrap is now being run through the inspectroscope and in many cases useful blanks can be salvaged.

For purposes of inspection, the crystal is immersed in a tank in a liquid such as mineral oil which has an index of refraction approximately that of the quartz, thus minimizing reflection of light from the surface. A powerful source of light is focussed on the crystal through the oil bath with or without polarizing screens. The location of the normally invisible axes of the crystal can be determined by means of polarized light. Exact measurement is made with the precision polariscope or with X-rays.

The first manufacturing step is sawing of the mother crystal into wafers, known colloquially to the operators as "baloney slices." Many types of saws are in use, since they frequently had to be improvised from existing machine tools, such as milling machines and surface grinders. In any case, the quartz crystal is embedded in or cemented to a rigid base, and the cutting is accomplished by diamond dust adhering to the saw blades, which are either steel or copper.

The next stage is lapping. A number of blanks are mounted in a workholder which is placed in the machine. Various types of silicon carbide abrasives are used. The blanks are taken from the machine to have their thickness measured with a micrometer and their degree of flatness in a comparitol gauge. Blanks are finished by hand

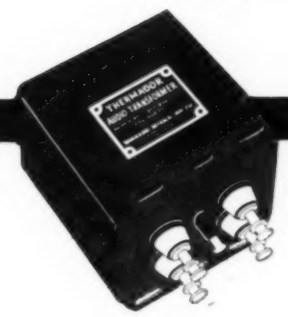


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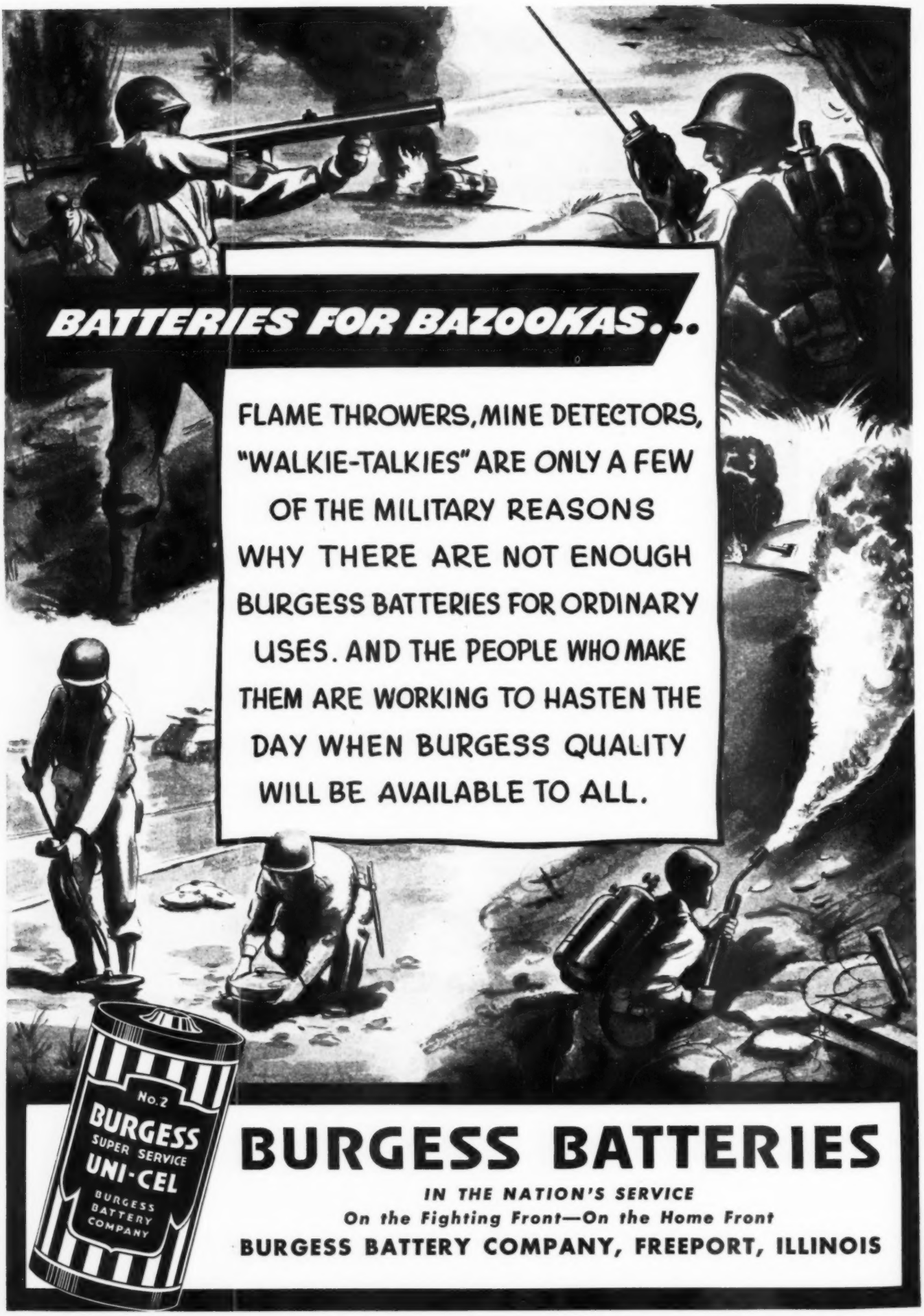
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lapping. This operation, like most of the work in crystal processing, is usually done by the hands of a girl. She holds the crystal between thumb and middle finger and rubs it over a fine abrasive, such as optical rouge, on a flat glass plate. The approach to final finishing is measured directly in terms of resonant frequency. The crystal wafer is placed in an oscillator along side a standard oscillator controlled by a standard crystal. The difference is an audio frequency beat note heard by the finisher in her earphones. The standard oscillator used in these tests is very often an actual Signal Corps radio transmitter of the type in which the crystal being finished is intended to be installed.

After the crystal has been mounted in its holder, it is further tested for stability under varying temperatures and for resistance of the unit to moisture. Thus, in the factory, the crystal unit must prove its ability to carry out the function that has been delegated to it on the battlefield.

-30-

Amphibious

(*Continued from page* 197)

and the armed forces have been keenly cognizant of the necessity of schooling Signal Corps, Navy, Marine, and Air Forces' personnel in the varied intricacies of signal communication in amphibious warfare. Joint amphibious communication schools have been established to teach not only radio code, procedure, and tactics, but also the science of loading communication equipment and personnel on the transports and cargo ships. The moving of troops and supplies ashore and the establishment of a successful beachhead have been also stressed. This vital information is imparted to chosen officers and men alike; the importance of this type of operation itself is highlighted by the significant factor that only outstanding officers are assigned to this work.

In the Signal Corps, an officer who has successfully hurdled his OCS course and has mastered the officers' advanced training course is now only at the threshold of a career in the amphibious forces. He must still learn to speak the amphibious language. He must learn that the wall is a bulkhead and that the stairway is a ladder, and after he has learned to master the talk of the sea-going soldier and has learned to clamber up and down the side of a ship he is then ready to proceed with the science of loading, unloading, and landing. While all of this training is going on he is still being drilled in all of the arts of signal communications.

It is impossible as yet to say when this war will be over. But it is possible to say that when the last shot is fired the United Nations will have fought their way to victory in almost every theater as a result of successful amphibious operations. And in days to come when Allied soldiers reminisce and relive those courageous and death-haunted assaults, it will inevitably arise that the success or failure of every phase of those grim battles turned on the successful accomplishment of the Signal Corps motto: "Get the Message Through."

-30-

Signal Supply in ETO

(*Continued from page* 115)

Officer. However, combat experience has indicated that certain types of equipment can be maintained on what is known as "zone of interior" percentages, which are somewhat lower.

Many items of signal equipment are very expensive or because of their technical nature, are manufactured of highly critical materials. These are known as "controlled items" and are given special handling to assure strict conservation. Their distribution is centrally regulated by the Signal Supply Service.

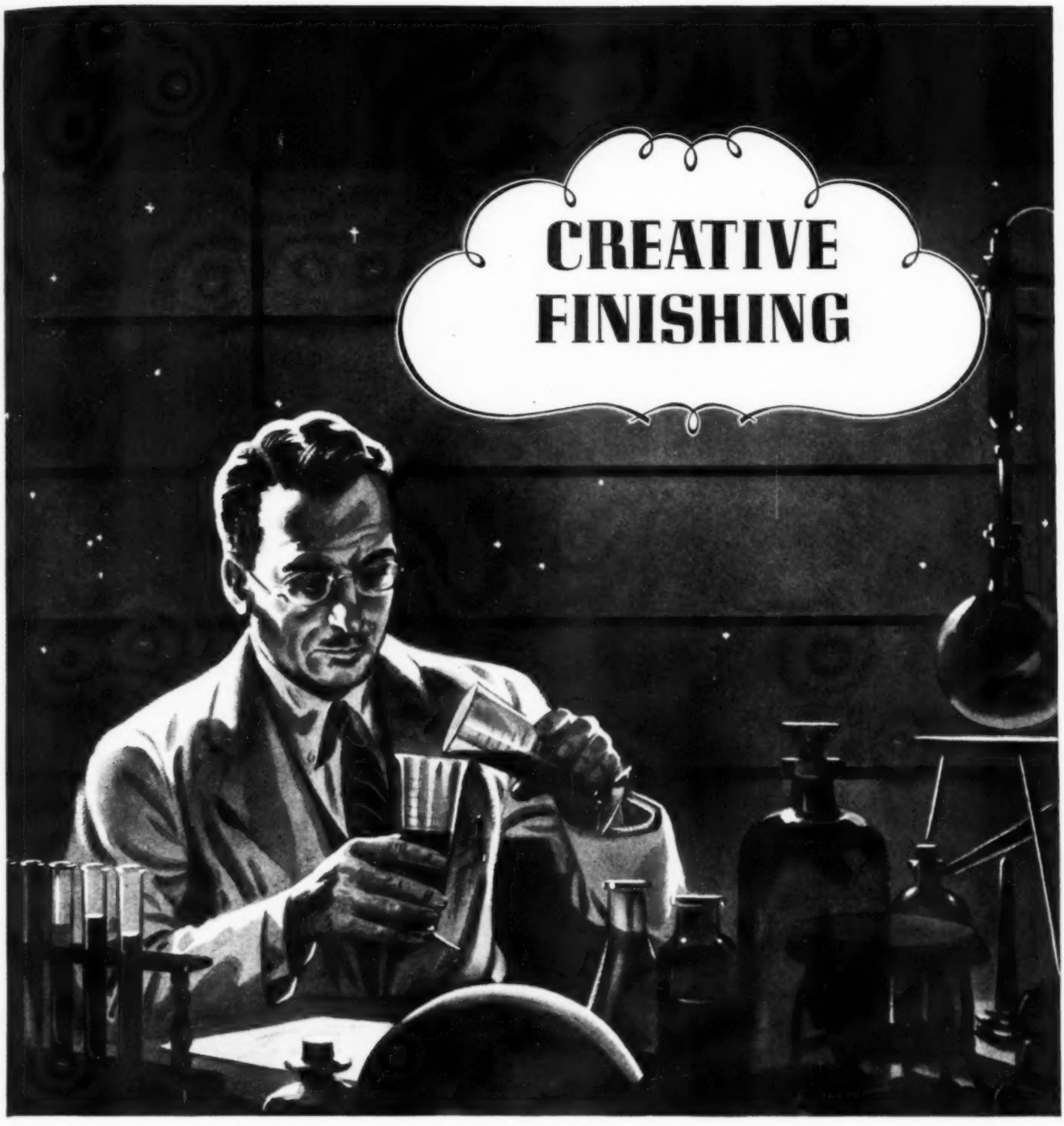
Stocks of non-controlled items are maintained at a level in accordance with figures set up by the War Department.

To save critical shipping space, the Army has found it expedient to obtain much equipment and supplies locally, through the whole-hearted cooperation of the British Ministry of Supply. The savings in this connection have been considerable and the substitutes have served their purpose with satisfaction. These locally procured items range from thumb tacks to a telephone exchange, large enough for a city the size of Syracuse, N. Y. The required procurement technique, involving complicated bookkeeping on both the American and British sides, had to be worked out literally from scratch, as there was no precedent to serve as a guide.

A physical problem of considerable magnitude is the location, manning, and administration of supply depots and repair shops. The locations of ports and sub-ports, the expected distribution of troop units in various staging areas, the road network, the railroad connections, and the availability of both active and passive defense measures all enter into the picture.

As supplies arrive at various ports, they are segregated into various classifications and shipped to the respective depots designated for them. Decentralization greatly speeds up the actual delivery of equipment to the people who want it. The word "service" in Signal Supply Service really means something over here.

Every organization has what is called a "table of basic allowance" or a "table of equipment"; this specifies the articles to which it is entitled for the accomplishment of its job in the military scheme. Troops arriving in this theater of operations are not accompanied by their organizational



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equipment but instead receive it here from the various services such as the Signal Corps, the Engineers, the Quartermaster, the Ordnance, and other service branches. The issue of the initial equipment is made through a system of requisitions originating, in the case of signal supplies, in the Office of the Chief Signal Officer in Washington. These requisitions travel through the necessary military channels to the proper base section signal officer, who notifies the proper depots when and where to ship the equipment for the organization concerned. This procedure has been systematized almost to a point of monotony. Often a newly arrived outfit hardly has time to open its barrack bags before it is already breaking out cases of telephones, batteries, radio sets, and other signal equipment.

The question is often asked, "Why don't the combat units bring their equipment with them from the United States?"

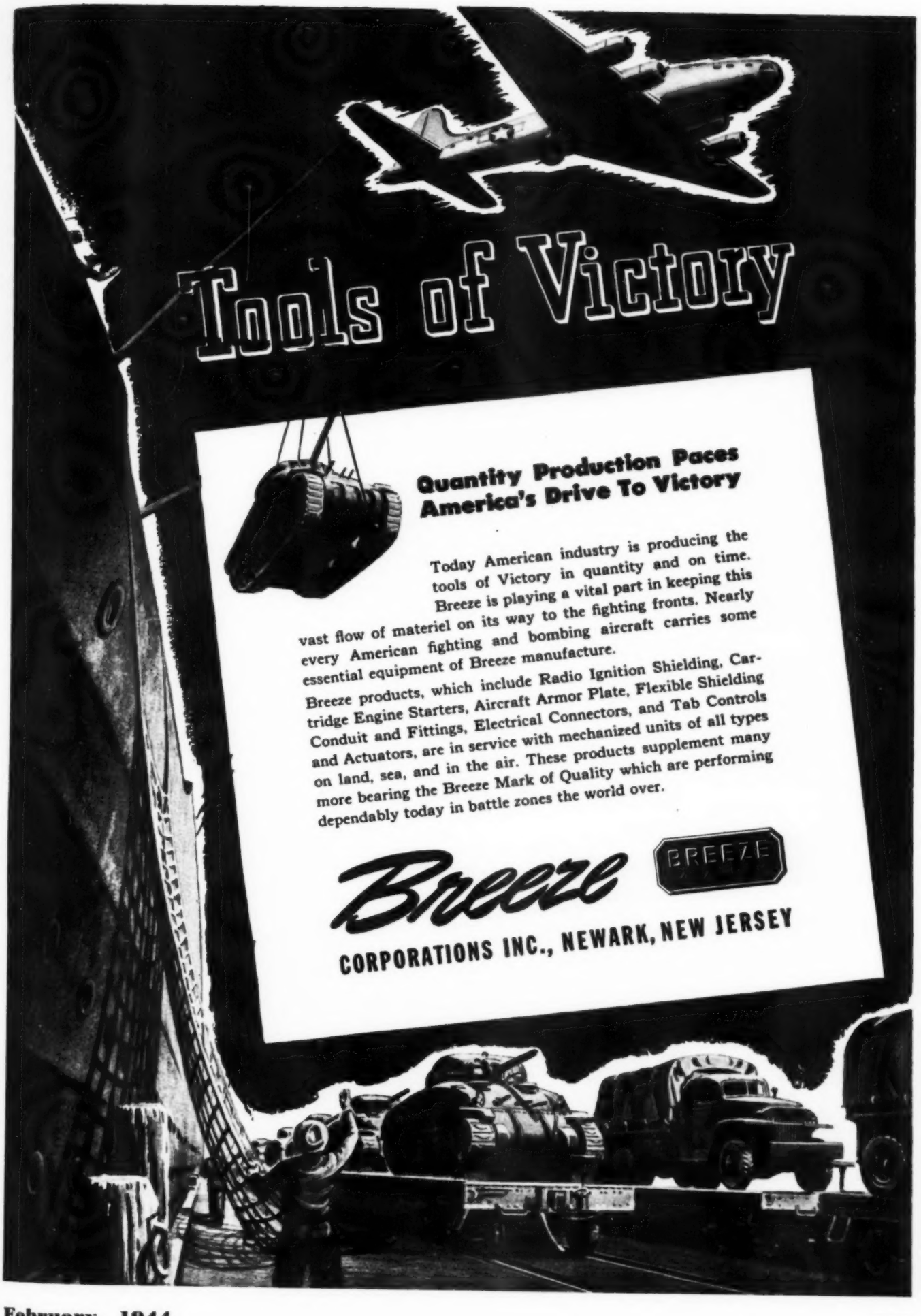
There are several good reasons. Firstly, the troops can be transported more readily if they are not impeded by heavy equipment. More important, however, are the requirements of the particular mission planned for each outfit. Will it fight in the desert, in the snow, in mountains, in a wet spot? Usually not even the organization commanders are informed on this point when they embark at a port in the United States. Before the North African operations in the fall of 1942, one newspaper correspondent turned up for the trip carrying fur clothing and snowshoes!

The preliminary planning of the supply picture even encompasses the ordering of special materials. For example, invasion troops moving into enemy-held territory might need miles of a particular kind of cable to rehabilitate a partially destroyed telephone system or transformers to work on some odd voltage or frequency not standard anywhere else. These problems must be anticipated so that, if necessary, manufacturers can make these items well in advance and have them ready when needed.

One of the growing activities of the Signal Supply Service, in this theater of operations, is its repair facilities. Repair shops are located at all depots and the ingenuity and resourcefulness for which American mechanics are noted are given free play. Hardly anything is ever actually thrown away; no matter how badly damaged, a piece of equipment is stripped down to the bare chassis and every nut and bolt, every condenser and resistor, is removed and saved, if possible, for re-use. "Cannibalizing" has become a fine art. One working telephone is often produced from three defective units.

The best tools and test equipment are available, and the methods used in the extensive electrical and radio repair businesses in the United States are applied here with improvements born of the necessities of war.

—30—



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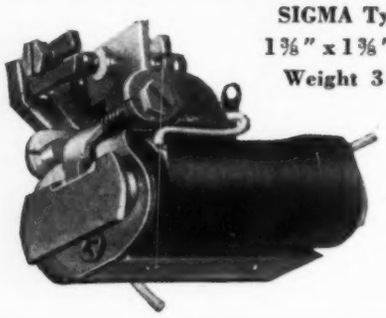
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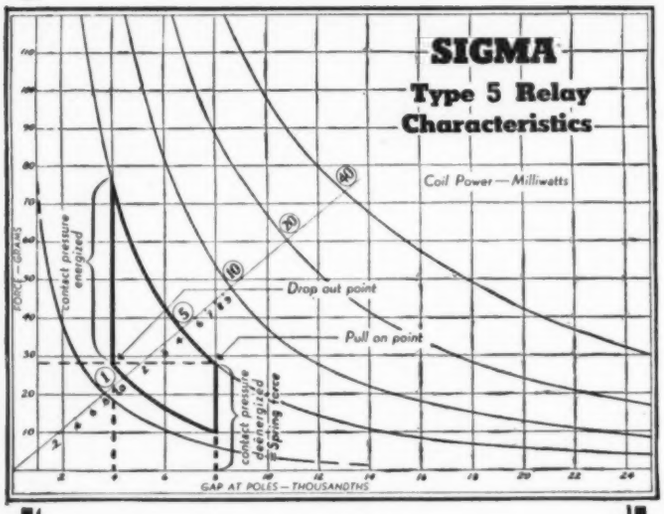
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1.0 Ohms	70.7 MA — .0707v.	22.4 MA — .0224v.
100. Ohms	7.07 MA — .707v.	2.24 MA — .224v.
1000. Ohms	2.24 MA — 2.24v.	.707 MA — .707v.
10000. Ohms	.707 MA — 7.07v.	.224 MA —2.24v.
20000 Ohms	.500 MA —10.00v.	.158 MA —3.16v.

SIGMA
Sigma Instruments, INC.
Sensitive RELAYS

Depots

(*Continued from page* 98)

chines, training for operating warehousing equipment such as fork lift or mobile lift, the warehouse "mule" or tractor, and in the technical field there is training to cover all phases of radio, telephone, motor generators and electric meters to enable employees to become more efficient in the repair and maintenance of items sent to the depot from the Armed Forces in the field.

The Maintenance Division repairs Signal Corps equipment to be returned to the unit from which it was sent, as well as to be placed in depot stock. This division consists of property section and repair shop. The property section receives, itemizes and classifies material to determine repairs required or the advisability of salvage. A feature of this department is the stock room consisting of the many thousands of parts needed for the repair of this equipment. The repair shop is divided into eight sections: radio, meter and photographic equipment, telephone and telegraph, teletype, motor generators, machine shop refinishing department and battery department. In some instances, enlisted men are assigned to work with civilians in this branch to receive practical instruction in the repair of communications equipment. A quick appraisal of incoming equipment determines within 48 hours if the equipment can be repaired. If not, a new unit is shipped from the Storage Division and the defective unit is repaired and returned to stock. Much of the equipment sent back for repairs comes directly from battle zones and often shows results of combat use; bullet holes, shrapnel imbedded in the units, corrosion by water and, in some cases, blood stains.

Stock nomenclature provides speedy item identification, enables military units to requisition items in convenient, rapid and positive manner, assures proper warehousing, promotes rapid selection and shipment of material on requisitions, facilitates procurement, and provides official reference for use by laboratory personnel. When an item is handled in large volume and a large variety of articles are handled simultaneously, it becomes necessary to classify items for warehouse purposes. In addition to being classified, items are given numbers. A standard description and stock number enables purchasing officers to readily identify the item and source for purchase. This description facilitates the preparation of the order on contract inspection reports and the final receiving report. The identification description of Signal Corps equipment usually consists of three parts: the physical description which describes briefly the physical appearance of the items in technical language; the electrical or performance description sufficient to identify an item to the using personnel, and the purchase description to identify the item to contracting officers.

Signal Corps stock numbers are assigned to items and parts of items appearing on tables of basic allowances, tables of equipment, tables of organization; items shown on procurement and issue parts lists; expendable supplies required in replenishment; items appearing on equipment projects requiring routine maintenance and designated by engineering project numbers as requiring storage and issue, and standard assemblage approved by the Chief Signal Officer, each item of which is separately stock numbered.

The assignment of stock numbers is made only by qualified engineering personnel specifically designated for the purpose. This assignment is based upon descriptive information obtained by or for such personnel which describes the parts completely so far as this identification and issue is concerned.

When material has to reach a port of embarkation by a certain date, a deadline is determined and the shipping requisition is so marked. When the requisition is received by the warehouse with a deadline date, it is immediately given highest priority. If a number of deadline shipments reach the warehouse at the same time, the port is called upon to determine which shipment is to be held in abeyance and critical orders are given priority, requisitions being

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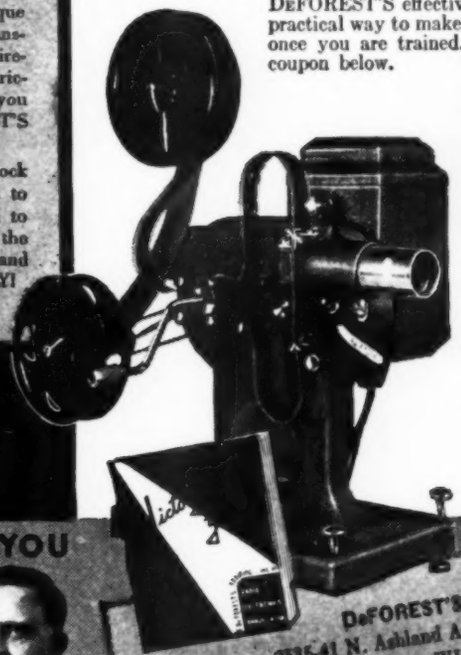
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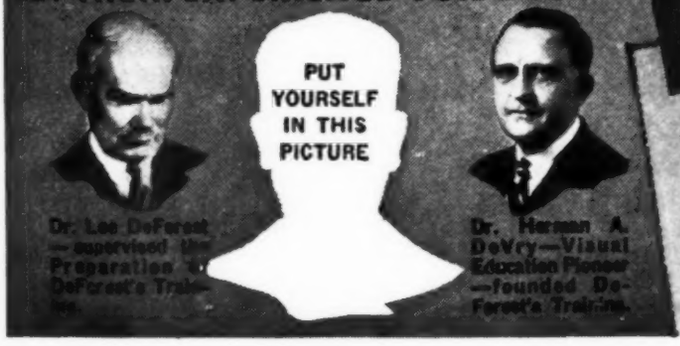
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marked "urgent" and a flag is attached to the papers indicating the order's priority.

When an in-bound shipment arrives by freight, commercial truck, express or parcel-post, it is immediately tallied in. The original copy of the tally, after being reviewed and edited in the receiving section, is forwarded to the office. The material, with a duplicate copy of the tally, is sent to the proper place to be warehoused. Even though the material may not be warehoused immediately, it is posted in the books so that requisitions may be filled from the material received. It is anticipated that the tally will be moved within 24 hours after receipt of material.

Every overseas shipment is packed in wood with a waterproof liner, the closure of which is sealed with a mastik. ¾" lumber is used on all packing material. All wooden containers for overseas shipment are banded and a staple is placed every six inches on the band. Extreme care is exercised in the stencilling of pertinent information on the outside of the container, especially code. Every precaution is taken by the packing section to see that the ultimate destination of the shipment which appears in code is correct and so spaced upon the container that all persons handling the shipment from point of origin to final destination can identify the shipment. Waterproof ink is used and whenever the material requires a dessicant, a silicate jell is placed within the container. Since many of these shipments are handled at their overseas destination by natives who cannot read, color markings are used to distinguish material for each technical service.

Information on the outside of the box is held to a minimum to avoid confusion and misinterpretation at the receiving point where the shipment is handled and rehandled.

In an effort to conserve lumber, the fiber industries have developed a product called V-board, impervious to water immersion, as well as salt air, to be used in packaging some Signal Corps items.

In packing overseas shipments, wherever possible, the weight of each container is kept under 100 pounds, due to the fact that at various points of debarkation manpower is used almost exclusively in the movement of the shipments.

In order to prevent material such as batteries from reaching its overseas destination with its shelf life expended due to the excessive heat and moisture in the holds of the ships, the batteries are waterproofed at the source in special sheaths which have a foil lining to prevent moisture and heat from penetrating to the batteries themselves. Plywood containers are used to some extent, depending upon the type, durability, and weight of material.

Since many items arrive from contractors in component form, it is necessary to make up or assemble the components into complete units, and rebox material which is returned from the field, so depots maintain box-making sections.

In order to expedite shipments which must reach ports by a deadline date every labor saving device available is used through the warehouses and packing rooms. Material is processed in the packing line on roller conveyors. In warehousing, material is placed on wooden skids, known as pallets, which permits material to be picked up by Fork Lift Trucks, operated by one man, and placed in the proper location. Dry batteries, for example, are received in containers weighing from 150 lbs. to 225 lbs. each. When this material is taken from the box car it is placed on a pallet (one pallet will hold approximately six battery containers). From this point on it does not have to be handled or lifted by a man but is picked up by a Fork Lift Truck, placed in the elevator and taken to the floor where it is ultimately warehoused.

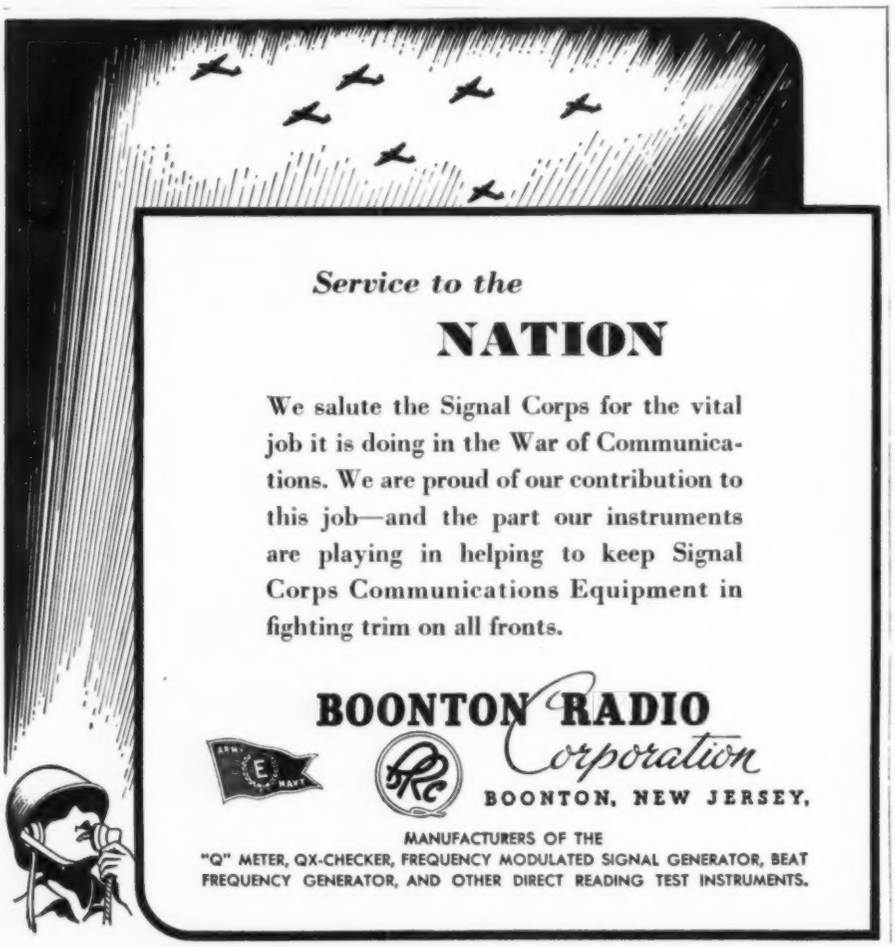
The use of the pallet in warehousing has meant a tremendous conservation in manpower and has speeded up the movement of goods, from the time of arrival to the time it is placed on the transportation medium.

Very frequently requisitions arrive that must meet an immediate deadline. In these cases, it is not unusual to get out a shipment weighing many tens-of-thousands of pounds within a period of hours. Within the running time it takes a government vehicle to drive it to the airport, the material is on its way.

The Stock Control Division is responsible for the maintenance of all depot stock records pertaining to Signal Corps supplies and equipment, physical inventories and appropriate adjustments to stock records. It maintains liaison with Service Commands and stations regarding stock levels, inventories, and disposal of excessive and obsolete stocks of Signal Corp equipment.

Requisitions received by telephone and mail, from the Office of the Chief Signal Officer as well as ports of embarkation and camps, are properly edited and checked for accuracy of stock nomenclature and stock number. Requisitions are then placed in folders which are routed to the Elliott-Fisher Bookkeeping Machine Section which maintains stock cards showing balances of all material stored in the warehouses and a shipping ticket vellum is made and placed in the folder from which additional copies are run on Ditto machines and routed to the warehouses for packing and shipping. From there these shipping copies are routed back to the office Shipping Records Section which processes all papers showing the number of boxes, cubic dimensions, weight, etc. From this point they are then routed in turn to the Transportation Center which handles the actual shipment of the merchandise.

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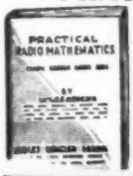


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Memorandum Receipts Section handles papers for all merchandise shipped with the expectation of its return, such as loans to manufacturers. It also maintains records on Depot Items and Supplies, maintains records on shipments from the field which are returned to the Shop for repair, and follows through on its re-shipment.

Special Sections are maintained for individual functions, such as, the complete operation of the distribution of individual radio sets or on handling International Aid shipments, as well as for routine clerical work necessary in handling correspondence and file of all papers.

This is the physical structure of the depot system. But a bare recital of its organization can give no true picture of the magnitude of the operation. For example, the system of keeping records must be such that the records can be constantly consulted and studied, and yet they must be on hand in the file room at all times. When data from the files is required, therefore, a photographic copy is made in miniature studios in the file room in some depots. In a matter of minutes the original copy is in the hands of the person requiring it. The personnel system is another example of "know-how" applied to the individual labor situation in each depot area.

In-service training increases the efficiency of the individual employee, and, where practical, cafeterias and dispensaries are available to cater to the workers' comfort and welfare.

Property protection, special services, all the complex elements that go to make up the Signal Corps depot system must be kept under the closest scrutiny and efficient management to insure success in procuring, maintaining and issuing the supplies that "Get the message through."

—30—

Pacific Theater
(*Continued from page* 154)

"Why, one of our Signal companies strung a pair of wires for 130 miles on one of those islands out there—and killed 32 horses doing it."

The jungles, the high humidity and heavy rainfall played havoc with equipment and operations, especially in New Guinea.

Recovering from the effects of Japan's surprise blow, the United Nations began driving the Japs from the wicked Owen Stanley Range, the backbone of New Guinea. There, in addition to the mud and the mountains, our forces encountered a unique obstacle. Instead of erecting wire entanglements, the Japs used the lush and tenacious vines native to the region. Shells poured into the obstacle merely seemed to interweave the vines more tightly and make the barrier even more impassable.

Still, the Signal men got through.

Petulant radio "hams" in the United States, who often call for vengeance against local atmospheric conditions and threaten to smash their sets when heavy static is encountered, would find that the source of their annoyance at home is but fleeting compared to some of the reception obstacles on the Pacific fronts. At first, during early stages of the assault from Port Moresby, radio was the principal means of communication. Atmospheric interference, jungle screening, and deterioration of sets through condensation



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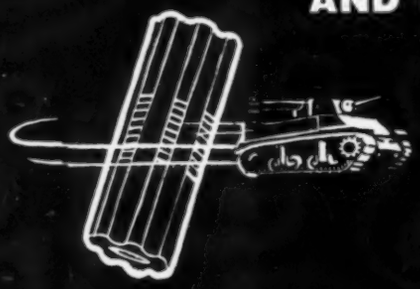
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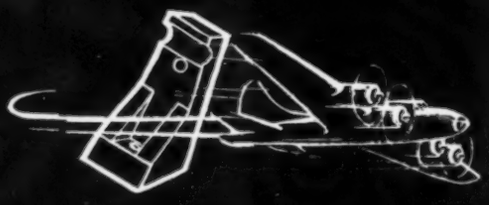
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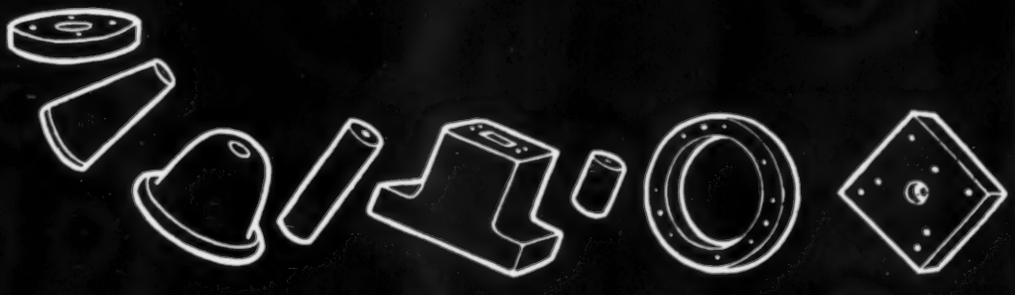
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hampered transmission to the extent, however, that wire construction was begun immediately.

Pending completion of circuits, a laborious process in which wire had to be carried in packs and on mule-back, the Signal Corps fell back on the age-old method of foot messengers. Bicycles were particularly useful, since they were lighter than motorcycles and more easily transported over barriers.

Along the northern and eastern coasts of New Guinea, the Signal Corps found heavy "tele-radio" sets which had been used by civilians to send weather information to fishing vessels. Technicians trained soldiers to operate the sets and soon were using them in an improvised aircraft warning system.

On Guadalcanal, signal companies found it extremely difficult to maintain wire communications due to lack of transportation and almost impassable terrain. Lines laid along jungle trails were continually knocked out by Japanese bombs or by road construction units. To maintain the lines at night, without lights for vehicles or flashlights for the Signal Corps men, became virtually impossible so that often radio was the sole means of communication.

"Two battalions of Infantry on Guadalcanal, which had entrenched themselves in the rear of the enemy, were so completely isolated that we had the utmost difficulty in supplying them, furnishing them communications, and evacuating their wounded," said one Signal Corps officer.

"We first supplied them by air but later were able to operate a boat line upstream to the base of a hill on which they had dug in. We used ropes and pulleys to get supplies to them and wounded were evacuated in the same manner.

"Air to ground radio sets were the only communications medium at first but later we were able to use our guidon radio sets which weigh only 16 pounds and have a normal range of several miles. The smaller sets, the five-pound handie-talkie and the thirty-pound walkie-talkie, were used for shorter distances by Infantry patrols and front-line troops. The distance range of all radio sets was diminished by the jungles, intervening hills, and other difficult terrain. Some difficulty was also experienced with signal equipment due to corrosion of metal parts exposed to salt spray along the beaches."

"The Japanese," said one officer who went through the Guadalcanal campaign, "are extremely clever in camouflaging their radio stations. One large transmitter with a large electric generator and Diesel engine was so well concealed that many passing troops failed to discover it. At last the sharp eyes of a chaplain located it. As a whole the Japanese radio equipment seemed to be designed with the idea of high portability. It did not appear to be well-designed from the viewpoint of moisture proofing."

The Signal Corps participated, also, in the expansion of air activities. Wherever the Air Forces set up its bases, the Signal Corps went along to install, and in some cases to operate the equipment. There, too, the Signal Corps accepts all the dangers of men in combat.

Col. John H. Brewer was posthumously awarded the Legion of Merit and the Purple Heart after being killed in action during May, 1943, while on duty as Signal Officer for a fighter command.

"Colonel Brewer made an important contribution to the defense of Northern Australia and to the success of the Papuan campaign," read the citation. There have been other decorations—for example, Capt. Claudius G. Farrow, Jr., was cited for overcoming "major handicaps and unusual problems" with radio equipment for a Pacific task force.

For the most part, however, the rank and file of Signal Corps men feel amply rewarded by that terse comment in a battle report:

"Communications were maintained continuously throughout the operation."

—30—

European Theater
(*Continued from page* 150)

boot, a Fifth Army Signal team worked south, through enemy-held territory, to meet them. In one week's time this unit itself cleared more than 100 miles of civilian wire line and rehabilitated it to military use.

The story of the Signal Corps' part, in the early stages of an invasion, is essentially the story of its part in war, day in and day out. Allied territory is ever expanding, bringing with it demands for more complex and extended lines of communication. Initial installations, set up under fire, soon yield to intricate telephone lay-outs, teletype networks, and extended buzzer telegraph circuits. Light airplanes are utilized in courier runs as the facilities rapidly expand and in a few weeks, underground cable systems put military communications on a par with the best on the home front.

It was stifling, that particular forenoon outside Gela, Sicily, and advancing Infantry patrols had paused for a breather on the dust-dry road to Vittoria. A battered quarter-ton bantam, carrying four helmeted figures, rocked past and sped on to disappear 'round an elbow job half a mile down the slope. The small "PRIORITY WIRE" sign on the vehicle's stubby nose was barely readable through the clouds of red powdery silt kicked up. The occupants of the stripped-down peep included two Signal Corps officers, a technical sergeant, and the driver, a private. They were seeking a suitable wire route—reconnaissance—for the day's attack when they inadvertently encountered, around that elbow-bend in the road, what later proved to provide the stiffest local opposition faced by American troops in the first hours of the island's invasion.

By all military standards, it couldn't happen to the Signal Corps, for the manuals dryly state that Signal personnel are vested only with the combat mission of providing communication for such large units as Divisions, Corps, and Field Armies. But here was this perky bantam, now slowing to a stop, while less than 200 yards away came the first of five Mark IV German "specials" followed by waves of Italian infantry.

As the lead tank's 50-caliber machine guns stuttered to life, all four men in the peep hit the ground, crawling for dubious cover offered by a cactus hedge bordering a vineyard, half a dozen yards off the road and slightly to the right. A hasty conference ensued as heavy slugs cut through the vines overhead. Technical Sergeant Don W. Carter, of Creston, Ohio, would try to make it back to warn our own Infantry of the now discovered counter-attack, while the others, Lt. Colonel William B. Latta, of Los Angeles, California; Second Lieutenant George Hands, of Detroit, Michigan, and the Private, Thomas Zeller, of Chicago, Illinois, spread out, hoping to survive by dispersing.

Treads of the first tank crushed rock and earth barely 18 inches from Lieutenant Hands' prostrate body as he lay screened from the driver's slit. All three dug in as best they could, using clips from their .45's, slivers of rock, and bare fingers. Less than a dozen yards from where Colonel Latta and Lieutenant Hands sprawled, they saw Italian infantry flush and capture Zeller (later, released unharmed in a successful Allied counter-attack).

"Then, all hell broke loose," Lt. Hands said. "We knew then that Carter must have gotten back, for it was our own artillery—afterwards we learned we were on the receiving end of U. S. Naval gunfire as well—that stopped those enemy tanks. Four were knocked out, the fifth scuttled backward, and the 'Eyties' pulled out in a hurry.

"I know now what the Germans meant in Tunisia when they claimed we had 'automatic' artillery, for we were buffeted about like nothing on earth. Our escape still seems miraculous."

When the barrage lifted nearly two hours later, the officers identified themselves to friendly patrols, picked up Carter in another vehicle, and continued on their mission.

Repeatedly, throughout the Italian, Sicilian, and Tunisian operations, Signal personnel found themselves confronted with similar and even more ticklish situations. Experience in combat has proven that in many cases, it is vitally necessary that Signal units go well forward, of battalion and Infantry company installations, in the performance of their duty. Commanding generals, down through the rough tough foot-slogger, will admit that



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without immediate, never-failing communication, victory is impossible—especially in the fluid warfare of the day, with rapidly fluctuating front lines as compared with the relatively static front of World War I, which extended rearward through friendly territory.

At the conclusion of the Sicilian campaign, Lieutenant General George Smith Patton, who commanded the American Seventh Army in the 38-day struggle for the strategic island, and who is noted for his brusqueness, singled out the Signal Corps for special commendation with his phrase:

"Without food, favor, or affection, the Signal men carried on.

The General's reference to lack of food applied in the main to the wire and heavy construction teams which at the height of the battle not infrequently worked steadily for 18- and 20-hour stints without rest and usually on but two meals daily, for they were constantly on the move.

Somewhat significantly, General Patton's remarks concerning Signal performance followed by, but a few days, an impromptu conversation between himself and Technical Sergeant Richard Redding, 27, of North Kingsville, Ohio. Spurred well in, high atop a 30-foot pole, a mile out of San Stefano, on the north coast road, Redding was tying-in a telephone line. He was utterly oblivious to waves of Messerschmitts, coming in over a low hill to his back, for bombing and strafing runs on shipping and railway transports being loaded for the first of the two highly successful, amphibious landings behind enemy lines.

Redding presented a perfect target, outlined as he was against the sky but he worked on, so engrossed, that he failed to identify the general who had driven up to hail him from the foot of the pole:

"Hey soldier, what are you doing up that pole?" Without looking down, Redding shouted bluntly, "Working!"

"How long have you been up there?" the general wanted to know. Redding said about 20 minutes.

"Don't the planes bother you?" General Patton yelled.

"Hell no, but you do!" Redding bellowed in exasperation. The balance of Redding's crew at the foot of the pole gulped and expected fireworks but the general turned away, smiling. Redding swears, to this day, that he didn't know he was talking to a general.

In any large-scale operation, particularly amphibious in nature, Signal planning must of necessity be long and thorough for innumerable reasons, chief among them being the exceedingly delicate nature of equipment and its susceptibility to damage from salt air and water; the care necessary in the landing of such equipment from the invasion barges; establishment and maintenance of early communications from ship-to-shore; and the setting up of initial facilities once on the beachhead. From this point until weeks after the cessation of fighting, Signal headaches multiply a thousandfold.

British and American Signal units, participating in the Sicilian show, readied themselves for fully five months prior to D-day. To deliver both tactical and administrative messages, maps, wire overlays, and regulations over an area (the extremes of which were 1,100 miles distant) within a maximum of 24 hours, to all units concerned with communications, presented a problem that required the combined ingenuity of members of both Allied signal sections.

This was accomplished by the maximum use of radio, telephone and teletypewriter, motor messenger, and air courier. The latter alone travelled a total of 2,260 miles daily. Motor messengers averaged a daily total of better than 700 miles, while radio and teleprinter accommodated hundreds of messages.

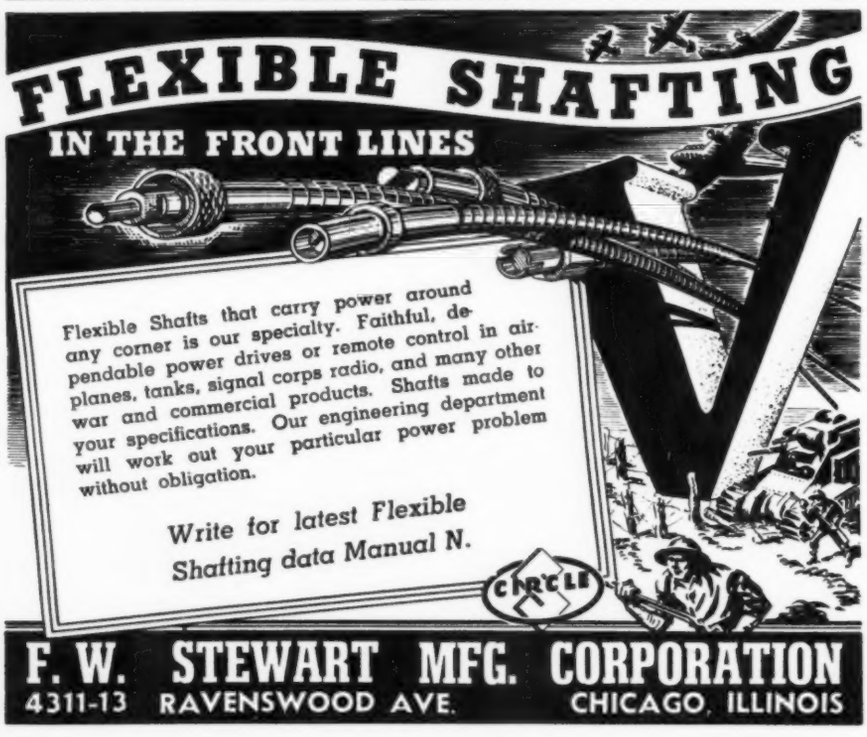
Training presented a distinct problem. Only a smattering of the units to go into Sicily had previous combat experience. Many units had received new or replacement personnel to the extent of approximately 25 per cent of their total strength. Schools were established at convenient locations, however, and key personnel from both sections attended. Special emphasis was laid on radio procedure to give unified operation.

Approximately 100 supply requisitions were prepared, to be filled in the U. S. proper, and in the North African theater of operations. These represented almost 20,000 tons of Signal equipment, which it was necessary to receive, record, and issue or prepare for over-water transport to Sicily. Many items required special packing to prevent damage when being landed. Other special-phased requisitions were prepared for Ranger and Airborne outfits. Of particular interest and a constant source of trouble was procurement of waterproof bags, which were ultimately supplied to units for wrapping of Signal items where probability of damage from salt water might be encountered. These later proved their worth when several individual radio units were floated ashore in the buoyant, water-repellent sacks.

It was at this time that General Patton conceived the idea of a certain type and number of amphibious radio units, previously mentioned. He deemed them absolutely essential to the success of the thrust. Without previous warning, First Lieutenant George Shaffer, 32, of St. Joseph, Missouri, received rush orders to design, test, and construct a pilot model. Improvising with what little was available, requisitioning from nearby supply depots, and redeeming other necessary parts from wrecked half-tracs littering North African soil, Lieutenant Shaffer and his men set to work. Within two weeks from receipt of the job order, the first model was ready for testing in the waters of the Mediterranean.

Fortunately, as it later proved, the sea was rough for the first time in three months and with breakers from six to ten feet high, the model withstood every test and surpassed even the wildest expectations of its designer. Gratified at the performance of the pilot craft, more were ordered promptly by the General. Lieutenant Shaffer set up a miniature assembly line with seven distinct stages of construction. Supplies were flown in from as far as Casablanca. Within four days of the tests, completed amphibious radio units rolled off the line at the amazing rate of one a day. When our forces hit the beachheads July 10, these units proved invaluable.

For his ingenuity and designing ability, Lt. Shaffer today wears the Legion of Merit ribbon. Two other enlisted men of Shaffer's resourceful unit—





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Technical Sergeant Howard Benz, 27, of Cleveland, Ohio, and Sergeant Wilbur Etter, of Chicago, Illinois—also were awarded Legion of Merit ribbons for outstanding performance in North Africa. Etter for his work in improving communications for the Roosevelt-Churchill conference at Casablanca last January when he built repeater and carrier systems to bring order out of chaos wrought by the use of long, faulty French lines between Casablanca and Oran, and Benz for his diligence and devotion to duty in installing, aligning, and maintaining radio sets in tanks and tank destroyer battalions. Benz' commanding officer termed the former General Electric employee a "positive genius with radio."

Aboard the floating headquarters' ship, special improvisations were necessary to accommodate communications' installations and personnel. Because of this problem, personnel worked under the most trying of conditions during the landing operation. Ventilation was a constant source of trouble, as the temperature during the first few days soared under the blazing sun. Radio operators, and code and cipher personnel functioned flawlessly despite the cramped conditions, long hours, bad air, and bombing and shellfire from shore batteries.

Some 15 Signal detachments went in with the assault waves in three simultaneous pre-dawn landings. Despite early anticipated confusion, these outfits were soon set up and in operation on the beaches, enabling unit commanders to control their forces and coordinate the drive inland. As rapidly as areas were absorbed in our advance and even while pockets of resistance were in the process of being mopped up, work was underway on the rehabilitation of existing circuits and the laying of new lines was started. Considerable damage was caused to all overhead circuits but by soldering defective splices, under withering sniper activity; transposing of wires to clear cross-talk; replacing insulators, shattered by small arms fire; placing new poles, splintered by bombing and artillery blasts; and by retying and re-sagging taut wires; reliable communication was speedily effected. Considerable trouble was encountered from enemy sabotage.

Field wire lines were slashed and spliced into one another by the retreating enemy. Fine armature wire was wound round open wire and then grounded. Valuable hours were lost in searching for such cases. Hand grenades were detonated beneath low-lying strands and long metal bars were inserted between the strands and twisted into a hopeless tangle. More than 100 cases of enemy sabotage were encountered within a seven-day period between Gela and Licata.

Before the close of the campaign, a large number of suspected enemy saboteurs were taken into custody. One Signal company's personnel apprehended 16. Those found in active interference with our communication were summarily dealt with. Wire was hacked with axes, pierced with needle-like pieces of metal, and burned. Saboteurs hacked out five sections of a cable circuit between Palma and Agrigento, and burned it in two or three different places.

As wire communications were extended up island, efforts were redoubled to keep pace with the rapid advance of the infantry. This was accomplished by various crews working from dawn until well into the night. The speed of the drive did not permit thorough rehabilitation of open wire so new lines had to go down. The use of carrier equipment was impractical due to the unbalance existing on all circuits, many being composed of varying gauges of wire as well as having copper and iron sections interlinked. As much as 50 to 60 per cent iron wire was found in use along with the copper sections.

It soon became apparent that the operation, insofar as it pertained to Signals, would continue along two axes —one due north toward Caltanisetta, and the other generally northeast to Agrigento and Castelvetrano. During this phase, radio contact was extremely difficult to establish because of poor ground conductivity in the area and because the distances between command posts were, on occasions, beyond the normal range of lower-powered sets. On the whole radio served excellently for shorter distances.

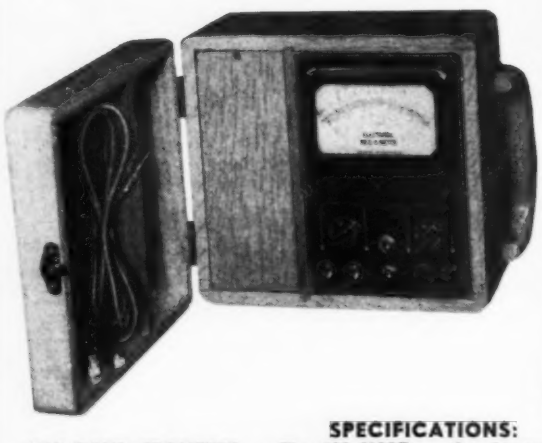
All long-distance telephone and telegraph lines in Sicily are owned and operated by the government. Local telephone systems are owned and operated by the Societa Esercizi Telefonica (S.E.T.), and long-line wire routes follow the railroads overland. Inland, wire teams encountered a new and deadly menace in the form of thousands of mines planted along the railroad right-of-way, at the foot of poles, between the ties, and just off the cleared stretches where new wire ordinarily would be laid. Here's where earlier training proved its worth. Using detectors borrowed from hard-pressed engineers who couldn't spare men for this work, Signal personnel attacked the mines and during the weeks that followed located and removed several thousand of the destructive instruments with a surprisingly low casualty rate.

Handicapped by the mines, on the one hand, and held to a crawling space by rugged terrain that even the versatile peep couldn't traverse, one unit succeeded in converting several bicycle-type railway hand cars into motor driven units. This was accomplished by removing engines from captured German motorcycles and installing them in the hand cars. These machines greatly facilitated the work of construction and maintenance teams.

Crews forged ahead in virtually impassable regions. When the going stopped wire-laying from peeps, equipment was transferred to mule-back. Signalmen continued to be hard put to keep up with forward elements, which at times advanced 15 to 18 miles in a

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INDUSTRIAL ELECTRONIC TUBES. General Electric manufactures many types of electronic tubes. G. E. developed the Thyratron which has made possible today's high production welding of aluminum and stainless steel. The G-E steel-jacketed ignitron is being widely used instead of rotating equipment as a heavy duty D-C power supply. G-E pliotron supplies the high-frequency oscillations used in industrial heating. G-E Kenotron supplies the extremely high D-C voltages required for smoke precipitation and air purification. Shown (left to right) are the ignitron, thyratron, and kenotron.

TELEVISION TRANSMITTERS AND RECEIVERS. Evidence of G.E.'s leadership in studio planning and station equipping is Television Station WRGB, in Schenectady, New York. This television "workshop" is one of the finest and most complete studios of its kind in the world. From WRGB will come much of the programming knowledge and technical development for the post-war expansion of television. Shown (left to right) are WRGB's studio, transmitter, and a G-E radio and television receiver.

TRANSMITTING TUBES. General Electric has probably made more important contributions to the development of transmitting tubes than any other manufacturer. For example: G. E. developed the first high vacuum tube without which radio as we know it today would not exist. G. E. developed the first water-cooled transmitting tube which made high-power broadcasting possible; also the hot-cathode mercury-vapor tubes which cut broadcasting power losses greatly. (Left) Typical G-E transmitting tubes.

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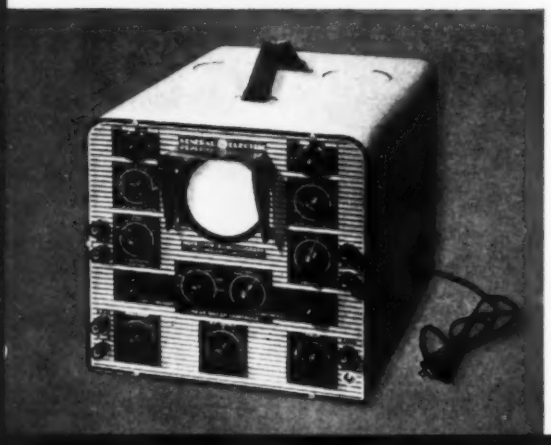
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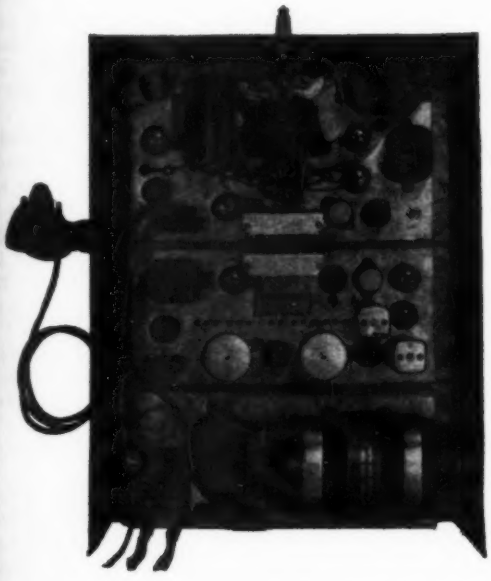
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day over jagged mountainous areas.

From Palermo on through to Messina, roads and lines were damaged almost beyond conception. The Seventh Army's rapid advance was assisted by two surprise landings behind the enemy along the coast in the vicinity of Torrenuova and Brole. During these landings, Signal personnel and equipment played an important role. Under the constant pounding of Messina from the Italian mainland in the closing days of the action, an American Signal battalion laid lines right through the city and around the tip of the island extending to the south to effect junction with the British.

Instances of personal bravery and performance beyond the line of duty on the part of Signal Corps' troops were numerous. For outstanding ability as a wire scout and for clearing mines from a stretch of railroad with nothing but a few minutes' verbal instruction, Master Sergeant Ivan G. Heimlich, of Cardington, Ohio, was awarded the Silver Star. He volunteered to search for a cable link known to exist in a specific area. In pursuit of his mission, Heimlich was obliged to by-pass German artillery and machine-gun emplacements and, despite being blown out of a water-trough in which he had taken shelter, he located the important cable point. Upon returning to his unit, he not only completely succeeded in his duty but gave information as to the location of the hostile guns which resulted in their being knocked out.

Outside Nicosia, a Signal power unit burst into flames one night near a Corps' command post. Under bombing and strafing from Focke-Wulf 190's, First Lieutenant Glenn L. Webb, of Los Angeles, California, Corporal Angelo Jeffries, of Birmingham, Alabama, and Private Donald H. Norris, of Chicago, Illinois, exposed themselves to bring the flames under control and save the installation from further punishment from the air. All three now wear the Silver Star.

Captain Max F. Meyers of San Antonio, Texas, recalls the night he was in contact with one of his telephone switchboards located near a bridge being subjected to constant aerial attack. The youth on the other end of the line was exceedingly polite and knew all the conciliatory phrases as well as the answers. The hotter things got, the more polite he became. Finally, he said, "You'll have to excuse me for a moment, sir. That last bomb was mighty close, and they're coming in again. May I ring you back?" He did, and Captain Meyers heard a chunk of debris hit the board after the soldier had kept his promise.

Within the towns and cities, destruction of communications centers was almost complete. What the enemy had not demolished before evacuating, bombing and shellfire had. Italian switchboards were found to be inferior for military use and local lines were poorly maintained. Trouble-shooting crews walked up to 25 miles a day to locate faults and at times would be away from their outfits for many days.

Electric power presented an acute problem as the hydro-electric sources in Sicily, like those of other Italian islands, have not hitherto been developed to anything like the extent of those on the mainland itself, although prior to the invasion there existed plans to provide considerable increases in capacity during the next few years. An additional obstacle, to a highly-developed hydro-electric system, lies in that many of the island's rivers are neither powerful nor accessible enough for building work to be done other than by a long and costly undertaking. Both in 1937 and 1938 the six important hydro-electric plants produced 70-75 million KWH, or about 35 per cent of the island's total power output. Before Italy's entrance into the war in 1940, the coal for Sicily's thermal plants was imported from Great Britain, Germany, or Poland. Before Sardinia and Corsica were reoccupied by the Fighting French, the coal came from those islands. Military power units supplied the current for electrically-operated equipment.

Excellent precision Allied bombing in Palermo saved days—even weeks—of additional work for the Signal Corps when in "knocking out" the S.E.T. office, one huge bomb shaved the building in half, the force of its blast destroying everything up to within one foot of a complete new automatic telephone exchange. Military locals were tied in promptly, and the board accommodated hundreds of lines. Civilian telephone service is discontinued immediately as soon as a city is occupied and only those lines, approved by the Allied Military Government of Occupied Territory, are allowed to be opened again.

Considerable destruction of underground cable and open wire circuits, due to bombing and naval shelling, was also encountered in Palermo. The rehabilitation of open wire, which inside the city itself were thrown over the tops of partially-destroyed four and five-story buildings, stalemated progress until Staff Sergeant Bolish Piasecki, of Moosup, Connecticut, thought of using the local fire department's lone extension ladder. From that point on out, work was simplified materially, and the danger from crumbling walls was lessened.

The San Stefano-to-Messina phase presented a series of trials entirely peculiar to those previously encountered. One unit was required to operate against determined enemy resistance on a narrow coastal ledge where the length of the front was restricted, by mountains, to a mere ten miles. Communication was along a single, narrow coastal road interrupted by frequent enemy mine fields, interdicting artillery fire and demolitions.

This road provided a natural wire axis from which no unit could deviate, however. Open wire lines were non-existent. The operation as it developed involved a series of enveloping movements, by one regiment at a time, over rough country. During the ensu-

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ing battle for San Fratello, it was necessary to lay a five mile stretch of wire over a trackless mountainside on which a man could move only by the use of his hands and a 15 mile stretch, where wire could be transported only by pack animals and laid by hand. This wire was put in at a rate determined by the advance of the pack train. One six mile link, from the coast road to San Marco, required 24 hours to put into continuous operation because the canyon-like road, on which it was placed, was under constant shellfire and was used by several battalions of artillery.

Army ground forces during the campaign laid and maintained a total of 49,176 miles of wire. This fantastic figure included rehabilitation of 950 miles of pole line construction, and the actual laying of 24,588 circuit miles of wire. Additionally, 1,800 miles of cable were placed during the operation.

Radio alone handled almost one million words. This figure does not include total cipher groups actually sent, as many of the messages were to several addressees, requiring transmission over several nets.

Due to lack of transportation, pigeons were not used at any time. Had they been available, it was felt that this agency of Signal communication could have been used to good advantage as the terrain and the rapid rate of advance of troops in some sections made the use of the birds highly desirable. In many cases, units were dispatched into the mountains to clear enemy pockets and to flank positions already held. Baskets of pigeons could have been carried by these troops and used advantageously.

Visual communications were not employed to any appreciable extent, except in one or two isolated instances wherein smoke was used to indicate positions of front line troops to friendly aircraft.

Intelligence, both friendly and enemy intercept, worked excellently. Scattered minor instances of security breaches were reported but these were held to a minimum and friendly service methods rapidly corrected infractions.

Most outstanding incident portraying the determination of personnel of the Signal Corps to live up to the letter of the arm's motto "Get the Message Through" is presented in the record of Second Lieutenant Harry Bender, of Pittsburgh, Pennsylvania. Bender was only recently commissioned from the enlisted ranks. During the campaign, this junior officer was assigned the task of delivering a message to a certain general—address unknown—and return to his own headquarters before dawn with the answer.

In the pursuit of his mission, Lieutenant Bender crashed in a liaison-type cub airplane, and was badly shaken, but carried on, in the face of other discouraging odds, to fulfill his assignment and return shortly before daylight with a wire overlay for that day's operations. This Signal Officer, similar to hundreds who are coming up from the ranks, out of the schools at Fort Monmouth, New Jersey, Camp Kohler, California, and Camp Crowder, Missouri, has been recommended for the Legion of Merit.

Thus the fight goes on—the fight to open communications and keep them open under any circumstances. The Signal Corps is doing it.

—30—

Military Personnel
(*Continued from page* 125)

Signal Corps private—now Lieutenant Joseph Lockhard—gave the first warning of the approach of Japanese aircraft at Pearl Harbor and that a Signal Corps private—Irving Strobing—sent out by radio key a stirring account of the final moments on Corregidor before our troops were overwhelmed. We are glad to do honor to the memory of Colonel William Herbert Murphy, killed in action in the Far Eastern theater, after devoting the major portion of his life to Army service. It is highly fitting that, because he pioneered in and developed much signal communication equipment now being used in this war, a camp should be named for him. These and many others are adding glorious pages to the annals of the Signal Corps. Some of their deeds of gallantry are told in another article in this issue.

In any attempt to describe the character of men that are bringing honor to the flaming torch and crossed flags of the Signal Corps, full recognition must be given to those pre-war officers and men who form the nucleus of our present, far-flung organization. Without further comment on the quality of those officers, except to say that they are meeting the most exacting standards, I want to express my conviction that no Army—anywhere—possessed a finer body of non-commissioned officers and enlisted men than those who served their country in the Signal Corps before Pearl Harbor. And I feel sure that their intense loyalty, their splendid spirit, and their intelligent discipline has made itself felt in all ranks of our wartime organization.

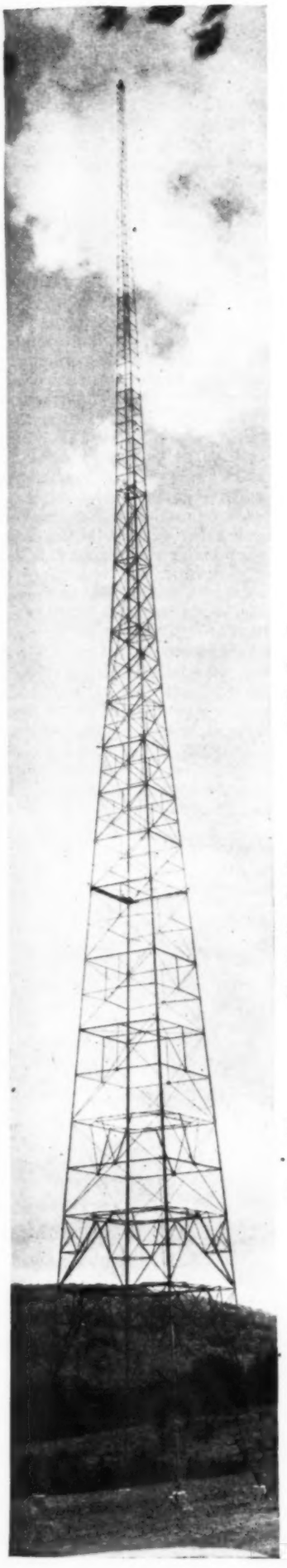
The present war has placed unprecedented responsibilities upon those entrusted with signal communications.

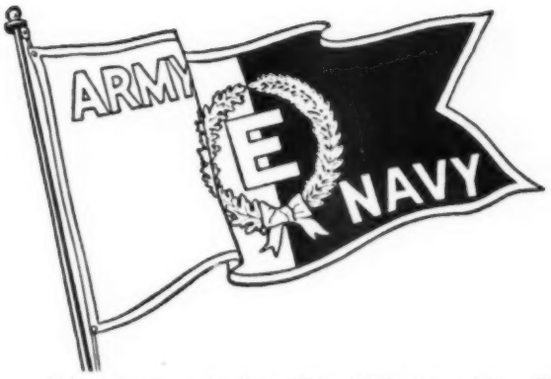
It is a war of world distances and of lightning movements. Orders and messages must overcome space and outspeed the fastest plane. Actions—thousands of miles apart—must be coordinated to the second.

The instrument of this coordination is signal communication and the heart and center of that communication is the Signal Corps.

Disaster threatens the Army which lacks accurate and dependable signal channels, and an Army commander, unable to transmit orders to front and flank and to obtain information from







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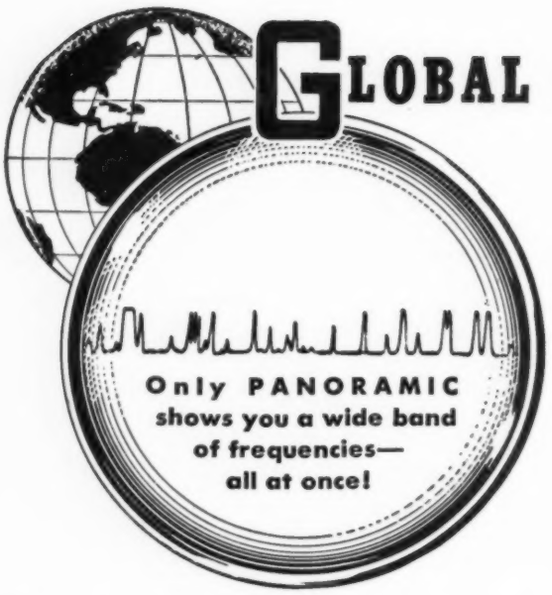
As a result of these and other activities, the Blaw-Knox Division was presented with the Army-Navy "E" Award on July 13, 1943; the highest honor that can be given to civilian effort.

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his units, is—by military standards—blind and deaf and defeated.

In our Army every soldier who delivers a message or receives a command is, in fact, concerned with signal communication but because of our modern methods—especially the telephone, the radio, and the teletypewriter—we have not only been able to improve and speed up combat communication but we have the equipment to send messages almost instantaneously to any part of the globe.

Much of this equipment is so complicated that a special organization of technically trained men is needed to install, to repair, and to operate signal communications networks throughout the world. The military personnel of the Signal Corps furnishes that organization which serves the headquarters of divisions, corps, and armies of the Ground Forces; the Service Commands at home; the Task Forces abroad; and the Signal Center of the War Department and the General Staff.

On the Personnel and Training Service lies the chief responsibility of procuring—under general Army policies—the officers and men to carry out the war mission of the Signal Corps.

It is fortunate that the Signal Corps has a particular appeal to men of a technical turn of mind—radio men, telephone men, electricians. Professionals and amateurs in these and related fields recognized that the Signal Corps offered them unusual opportunities to learn the theory and practice of electrical communication and to become expert in the maintenance and repair of the most modern equipment.

The radio industry, the telephone systems, the power companies and, indeed, American industry and business as a whole have contributed thousands of men to the Signal Corps. Top-flight executives, outstanding scientists, qualified engineers and research men, a great body of operating and maintenance personnel, salesmen familiar with the products, mechanics, shipping clerks and packing men—all have been drawn to the Signal Corps where they have found assignments suited to their experiences.

In its laboratories and in the Office of the Chief Signal Officer the Corps has gathered many of the Nation's best-known figures in the fields of radio, electronics, physics, mathematics, and meteorology. An outstanding telephone executive, Major General William H. Harrison, heads our Procurement and Distribution Service and other experienced administrative leaders in commercial life are found in similar capacities. Other men from industrial ranks are aiding in the construction of major communication lines in base areas, in the operation of extensive systems reaching out from the headquarters of a combat theater, or are exercising their talents in supply depots, embarkation ports, or in the thick of the fighting on combat fronts.

From the jungles of Guadalcanal



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come stories of former telephone linemen who have kept communications open through almost impassable terrain and have risen to the higher non-commissioned grades through their ingenuity in utilizing materials at hand and in improvising equipment when supplies were inadequate. We hear, too, of radio repairmen from countless small establishments throughout the country who are busy on combat fronts keeping signal equipment in working order or in manning the sets and, in many cases, getting more out of them than even the manufacturer thought possible. From our procurement districts, our depots, and our maintenance shops we get reports of former mechanics, shipping clerks, and warehouse men who are putting their skills to full military use. Former watchmakers and optical specialists are found in our laboratories grinding quartz crystals for radio sets; men familiar with precision tools are finding numerous opportunities; photographers are engaged in the production of training film and in recording the war in all theaters; and linguists are being used in various capacities.

Indeed, the Signal Corps owes a great debt to American industry which carried forward the advance of science and engineering. In the future, men now serving in the Signal Corps will, I am sure, repay that debt with interest when they bring back the knowledge and skills they have acquired in such diverse fields as communications, television, aerial navigation, electronics, and related branches of science. Not only private industry but the private citizen as well must benefit from this accumulation of experience.

From the beginning of the present war, the usual personnel policy of the Army has been to induct men, whether volunteers or from Selective Service, into the Army unassigned and then to determine, on the basis of classification tests and questionnaires, what their special branch assignment should be. However, a number of exceptions have been made from time to time to permit direct enlistment in particular branches by specially qualified men. The Signal Corps has received consideration in this respect because of its great need for men carrying out highly technical work in electricity or radio.

In building up sufficient numerical strength to fulfill its obligations to the Army, the Signal Corps determined to procure—wherever possible—"the cream of the crop." And in spite of this insistence on quality in its personnel, it has met the demands at home and overseas in full measure and to the complete satisfaction of the high command.

At the outbreak of World War II, the Signal Corps had only 16 more officers than it had at the end of the first war, bringing the number of officers then on duty to 2,728. The number of enlisted men was 13,627 less than at the end of World War I, numbering 39,650.

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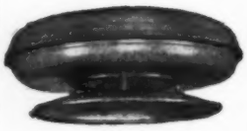


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The Signal Corps saw a rapid expansion in its military personnel during the first year of the war. Since then enlisted strength and the number of officers have reached even greater proportions.

Securing this number of technically qualified officers and enlisted men presented many problems, in view of the fact that after Pearl Harbor, almost all Reserve Officers had been called to active duty and the demands of the war effort upon the supply of civilians, qualified for Signal Corps duty, had depleted the source of potential officer and enlisted material. Between June and September, 1942, Training Centers and Pools had been set up from which officers could be withdrawn when the need arose, and the Enlisted Reservists, both Signal Section and Electronics Training Group, were being trained for future duty.

Toward the end of 1942 the immediate needs of the Army for additional officers began to be met through Officer Candidate Schools. In October, 1943 the Army Specialist Corps was discontinued as a separate organization thus eliminating one source of officers for limited service activities. Establishment of the Army Specialized Training Program in December, 1942, automatically discontinued all enlistments in the Enlisted Reservists, Electronics Training Program, and Voluntary Officer Candidate Schools.

By June 30, 1943 there were sufficient officers already commissioned in the Signal Corps, so far as total numbers were concerned, to meet requirements. The obvious need was that pertaining to the procurement of officers in special categories, which were technical in their nature and demanded much in the way of experience and training, which would require an undue amount of service training.

Continuing stress is laid upon the special training, which could be given officers already commissioned, to qualify them for special assignments as well as improvement in classification and assignment procedures, which make it possible to locate officers with rare skills and reassign them according to the best interests of the service.

A rapid growth in the capacity of the Officer Candidate School occurred during 1942, the peak being reached that year when classes of more than 1,500 candidates were graduated in a month and assigned to active duty.

Since then the immediate needs of the Army for commissioned officers from these schools were beginning to be filled and it has become possible to place even more emphasis on further training and on the development of a greater number of specialized officers to meet current and future requirements.

Among the more notable accomplishments of the Signal Corps—to which the Personnel and Training Service contributed in large measure—was the initiation and successful termination of the Enlisted Reserve Program which enrolled and trained more than 50,000 men who have gone to replacement centers, to the Army Air Forces, and to the Signal units in the Army Ground Forces.

No article on military personnel would be complete without a description of the Affiliated Plan which produced more than 1,200 officers and 4,000 enlisted men of proved technical ability.

In the late 1930's as tension in Europe increased, the Chief Signal Officer asked communications companies of the country to consider development of procedures through which the experience and knowledge of technically trained men from industry could be utilized by the Signal Corps, with adequate safeguards, so that the commercial communications systems of the country would not be too severely handicapped. The men were to be assigned to units which were to be activated as a nucleus of trained personnel around which the unit could be built.

In carrying out this plan, the Signal Corps selected the units which were to contain affiliated cadres and notified the sponsoring companies of the quantity and quality of the men to be selected. The companies surveyed their organizations and determined the number of men who could be spared. Employees were notified of the program and qualified volunteers were recommended.

The original sources of supply for affiliated personnel, were the American Telephone and Telegraph Company and the independent telephone companies but the following organizations were subsequently approved as sponsoring agencies: National Research Council, Academy of Motion Picture Arts and Sciences, American Racing Pigeon Union, International Federation of American Racing Pigeon Fanciers, and the Eastman Kodak Company.

As the needs of the Army began to be met, the Chief Signal Officer, in July, 1943, directed that no more personnel be considered for direct appointment with assignment to the Signal Corps. However, the procurement of affiliated officers and men was extended until August, 1943, in order to fulfill commitments made under the Affiliated Plan.

To put the right man in the right place is one of the most important and exacting duties imposed on Personnel and Training Service which is guided, of course, by the general policies determined by the Chief Signal Officer.

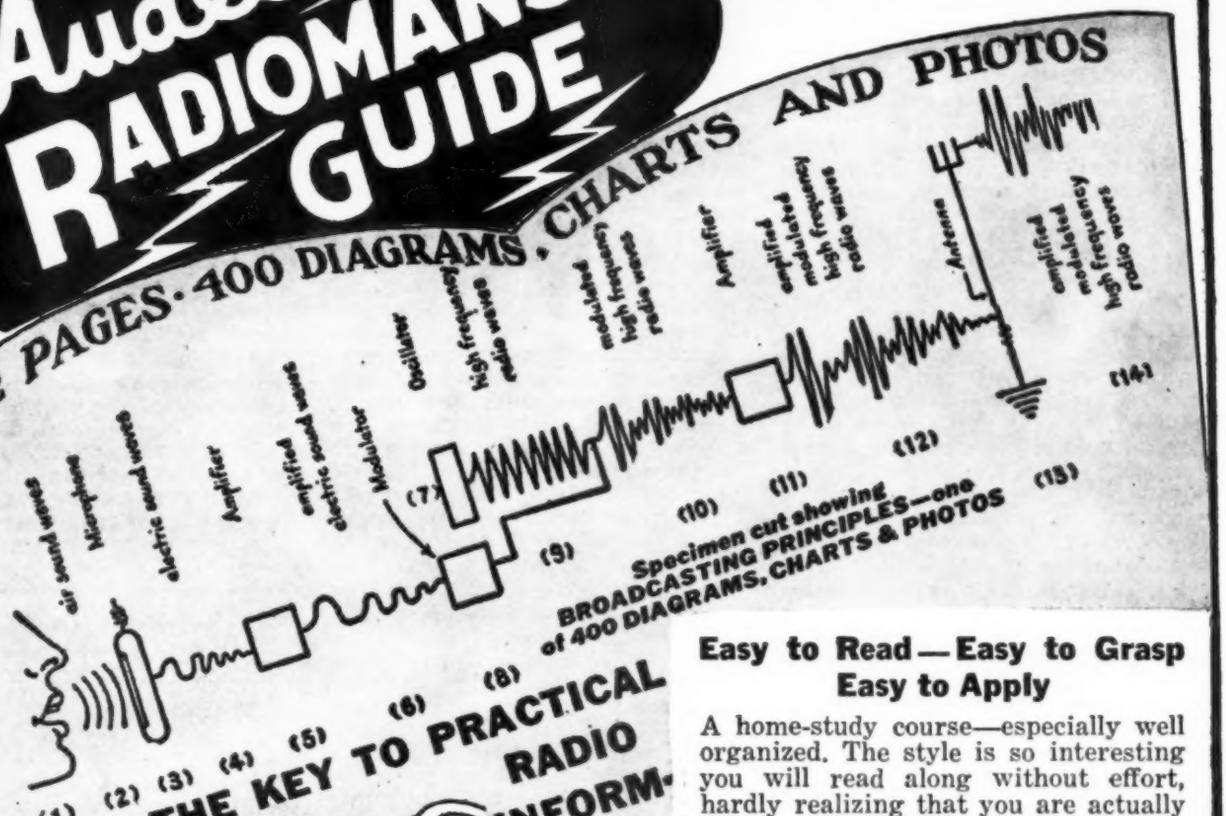
At the outbreak of the war, the vast enterprise of maintaining communications for an army which was expanding at an unbelievable speed, made it necessary that exacting standards be set to maintain high quality of personnel demanded by the Signal Corps.

The problem was not only to secure data upon which to base the selection of men, but also to familiarize the various elements of the command to the full significance of the words,

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"communications specialist." In most cases there was little or no information available on the classification of Signal Corps men. The Adjutant General's files were combed for all information on Signal Corps officers. This, together with information collected from qualification questionnaires, served as the source of information for classifying all officers.

Job specifications listed in Army Regulations were revised and in July, 1943, the first complete, up-to-date manual of Officers Military Occupational Specifications and Codes, to be compiled for a technical branch of the Army, was issued. This manual was distributed to all organizations and installations under the Chief Signal Officer. Copies were furnished the Army Air Forces who distributed them to all organizations under their jurisdiction down through Wings (the smallest unit of the AAF using Signal organizations). The Army Ground Forces were also given copies which were sent to all their organizations down through the Divisions and copies were sent to all the Theaters, Service Commands, Defense Commands, Technical Services, and other organizations.

All Signal Corps officers now have been classified in terms of the job descriptions covered by this Manual. Officers' principal duties are being reported in terms of these specifications and officers are being requisitioned and assigned through the use of the codes indicated. The classification of officers is now performed efficiently through use of a key-punched card which permits a rapid selection of varied categories.

In another article in RADIO NEWS, the story of the Women's Army Corps in relation to the Signal Corps is adequately described, yet I wish to pay a tribute from the Signal Corps to this splendid body of women and to testify to the important contribution they are making to our effective prosecution of the War.

WAC personnel are now serving in many camps and installations under the jursidiction of the Chief Signal Officer and they are also serving throughout the country as telephone operators, code clerks, message center clerks, teletype operators, radio operators, and in many other specialist capacities. Congress established the Women's Army Corps for service with the United States Army on July 1, 1943. The new Corps was to absorb WAAC personnel on discontinuance of that organization on September 30, 1943. On July 17, 1943, Women's Army Auxiliary Corps Headquarters directed all Service Commands to discontinue immediately the enrollment of women under the WAAC Signal Corps Trainee Program. All WAAC civilian training classes were closed prior to September 30, 1943 and women, who had enlisted in the WAAC Signal Corps Trainee Program, were not to be enlisted in the new Women's Army Corps while they were in school.

Women who had been enrolled in the WAAC Signal Corps Trainee Program were allowed to choose whether or not they would enlist in the new Women's Army Corps, on September 29, 1943. Only eight losses were reported; approximately two hundred and seventy women preferred to enlist in the WAC and continue their studies as communications specialists or be available for assignment to Signal Corps units. Upon classification by WAC Headquarters, it was found that this group of enrolled women represented extremely high caliber personnel, all having Army General Classification Scores of over one hundred ten, and many having achieved scores of over one hundred forty.

Any discussion of the men of the Signal Corps would be incomplete without reference to the thousands of civilians, both men and women, who man the supply depots, the procurement districts, the laboratories, and the inspection activities of the Signal Corps that are scattered throughout the United States. These people are soldiers, even though they are not in uniform and are carrying a tremendous load in the complex activities involved in the designing, procuring, testing, inspecting, and shipping of communications equipment to our Signal Corps troops in all parts of the World.

In concluding, let me make this prediction: whenever, in this war, crucial orders or historic dispatches are recorded, a Signal Corps man will be found at the communication controls and some day—the sooner, the better—a Signal Corps soldier will flash the first message of final victory.

—30—

Soldiers in Mufti

(*Continued from page* 239)

brand new costume but history will not distinguish it for being the mechanized war or the aerial war or the war of offensives but rather as the total war, where the peoples of parts of the earth pitted themselves against the peoples of other parts and the clashing armies all over the world were purely focal points of a great mass struggle.

The day is gone when armies alone carried the conflict, with some cheers from the homeland and some increased activities back at base in their arsenals and depots. Then the blood and sweat were for the soldiers, only the tears for the people.

Today civilians, too, bleed and sweat as well as weep.

In America alone, of the great warring nations, are they still secure from the bleeding.

In the Signal Corps alone, 40,000 men and women in the glamorless garb of civilians are needed to move the materials that carry messages through the smoke and stench and crescendo of battle.

But they are only a fraction of the immense army of civilians in private industry toiling to plan and produce the equipment the Signal Corps soldiers need to function.

They are scattered around the world, laboring at drafting boards, in laboratories, in fields and mines, on production lines, at railheads, in scores of varied occupations.

They don't see the foe fall, they wear no hero's uniform but they are as indispensable to victory as the guns and the phones and the planes and the radios they make—these soldiers in mufti.

—30—

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High up in his jungle roost, or down in the mud on his belly . . . waiting, watching, listening . . . he wants to know whether you're doing the things that will make his job easier, and the war shorter.

And if he were right here beside you, he might want to ask a few personal questions . . . like these:

Did you put some of this week's pay in war bonds?

Are you saving the scrap and fats and paper and other things we need to fight this war?

Have you given blood to the Red Cross to save the boys who are fighting to save you?

And . . . did you do your job today as if the outcome of the war depended on you alone?

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Signal Corps Wac

(*Continued from page* 247)

they were handling calls in French and Spanish as well as English, coming in from all parts of the world. Their dexterity and skill accounted for the accurate and swift relaying of messages upon which the progress of the Tunisian campaign depended.

These Wacs, as well as those manning the teletype machines did a "bang-up job," according to Colonel Floyd T. Gillespie, for many months Assistant Chief Signal Officer, Allied Headquarters in North Africa.

"After the girls had a few weeks of experience in their jobs," he said, "they were handling their assignments like veterans. The manner in which they picked up the work was outstanding. They were fast and they were accurate. . . . We could have used hundreds more. In fact, had we had enough of them, we could have used them to operate all our fixed communication installations—telephone and telegraph—throughout the rear areas. Every one of these girls released some man for Signal Corps duty up in the combat zones."

The former Chief Signal Officer of AFHQ added this compliment for Wacs on duty: "Don't tell me a woman can't keep a secret. Why, their own company commander doesn't know where the board is located, and we've tested the girls again and again. What they hear stops right with them."

In September, when President Roosevelt and other American statesmen met with Prime Minister Churchill in Quebec, 29 Wacs were selected to act as telephone operators and security mail clerks. Once on the job, the Wacs showed their usual versatility. A need developed for skilled secretarial assistance. Some of the Wacs with experience in that field were assigned to those duties, and proved themselves to be as competent and efficient in such capacities as they had been as telephone operators.

The first three or four days, the telephone operators averaged 18 hours a day on duty. They started work the first day in the afternoon and the next day were still on the job, without let-up, despite the fact that they took less than an hour to rest, after reaching the hotel.

As a result of the excellent way in which they handled the jobs to which they were assigned, commendations were received for each member of the group on duty there.

However, the number of these unusual assignments is small. The greater percentage of the Wacs are stationed at camps all over the United States. All AAF installations have requested radio operators and repairers as well as teletype and telephone operators. They have also asked for photographic technicians. Service force installations usually request telephone operators to take over Signal Corps duties.

-30-

Photographic Center

(*Continued from page* 249)

steady schedule of training films was produced. Up to 1937 all training film production was centered at the Signal Corps Photographic Laboratory at the Army War College in Washington. In that year part of this unit was moved to Fort Monmouth and in August of 1940 a wide program for the production of training films was organized at Fort Monmouth into what was then known as the Training Film Production Laboratory. In the Fall of 1940, when Selective Service began to draft millions of civilians into military life, the training film program was greatly enlarged overnight.

Far-sighted officers working and studying the production and use of training films over a period of years had prepared for just such an emergency, which found the set-up capable of immediate extension.

The Training Film Production Laboratories, together with the motion picture section of the photographic schools, was moved on May 8th, 1942, from Fort Monmouth to the Paramount Studio and the unit became known as the Signal Corps Photographic Center. The still picture section of the school was transferred from Fort Monmouth to Astoria on May 26th. Colonel M. E. Gillette became the first Commanding Officer of the newly established Signal Corps Photographic Center.

On September 22nd, 1942, at ceremonies to which were invited Mayor Fiorello H. LaGuardia and representatives of the press and radio, Major General Dawson Olmstead, at that time Chief Signal Officer, dedicated the Signal Corps Photographic Center. In May, 1943, Lieut. Colonel Roland C. Barrett assumed command of the Center.

At the Signal Corps Photographic Center is one of the largest and most modernly equipped producing units of Army training films. On the main stage and on the smaller lower stages, where once Maurice Chevalier sang THE SMILING LIEUTENANT, pictures are now being made to teach our troops the highly mechanized techniques of modern warfare.

When millions of men were suddenly pulled out of civilian life from every corner of the country, from every strata of society, and from every level of economic and educational background, the Army was faced with the problem of making good soldiers out of these men immediately. During a period of war, time is a priceless element. From experience it was known that training films, although they cannot replace drills and manuals, when used jointly with lectures and practical demonstrations in the field, can cut time required for training up to 30 per cent in most cases.

The military mission of the Signal Corps Photographic Center is to produce films that will help to train fighting men as quickly and as efficiently as possible. It is hardly necessary to point out that, in the present situation, training time is a vital element. It is a military asset that must be rationed as carefully as steel or copper or rubber. Time, unlike other military commodities, cannot be stretched out. There is no substitute for it.

The work of preparing a training film begins outside the Signal Corps when a branch of the Service, such as Infantry, Coast Artillery, and so forth, selects a topic for a training film and submits a picture plan to the Army

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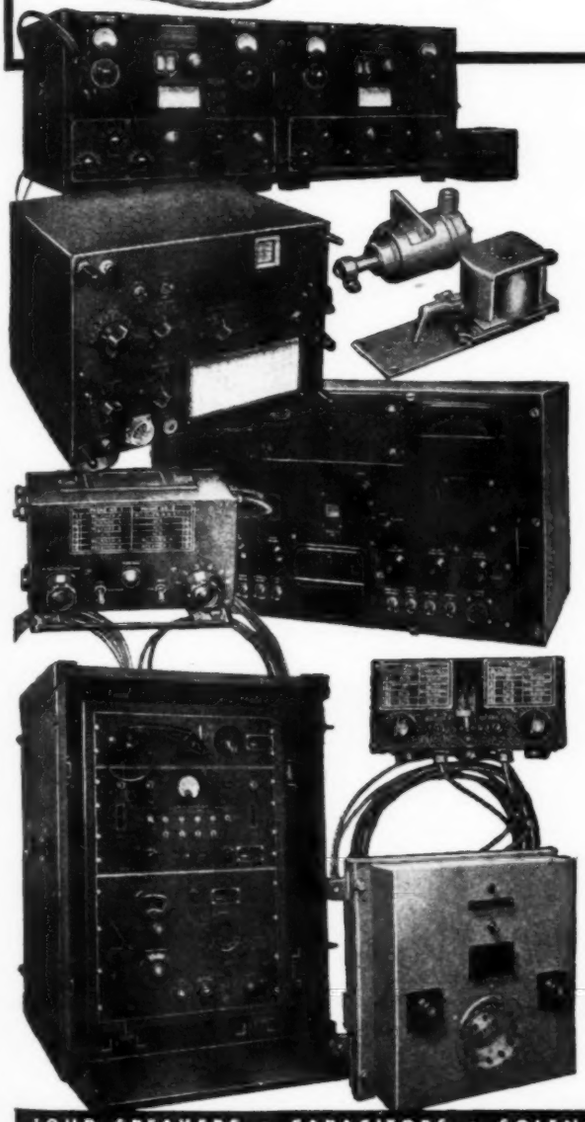
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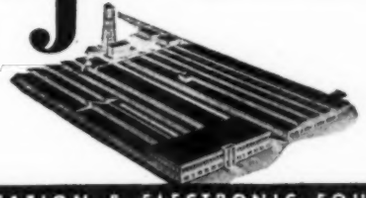


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Ground Forces or Army Service Forces director of training. If the idea is accepted, an officer of the particular branch of the service concerned is assigned to prepare a detailed outline of the film and to act as consultant. This done, writers go to work to prepare a photographic scenario based on the film plan and to compose the dialogue or commentary that will later be syncronized with the film.

There is only one valid test for any training method. Does it train men better and quicker than methods previously used? The Army is convinced that audio-visual education is a practical idea.

Modern war is fast-moving and thoroughly mechanized, which means that each man must be a specialist and thoroughly indoctrinated. These millions of men from farms, factories, shops, offices, hospitals, schools, and so forth, bring no background or proficiency in the firing of a 105 Howitzer, or the clearing of enemy mine fields.

The best way to teach a man the care and use of a complicated and entirely new piece of mechanism is to show it to him, let him handle it and work it, explain its functions and operations. In time of war when time is of such vital importance and when equipment must be in the hands of troops on the battlefield, the use of motion pictures serves many purposes. Many men at one time can watch a screen and learn how a weapon is put together and how it is used.

Another advantage of training films is that as each group of soldiers is brought into camp for training, the instruction is exactly the same not only in subject matter but in presentation and emphasis. After field drilling and practice, if the officers feel that the troops have not absorbed enough to make them competent, the film can be run off again. Troops in combat must be well-trained and completely trained, for a minor error or oversight can result in sudden death and disaster. The motion picture provides a graphic means of teaching and indoctrinating the soldiers in modern warfare and, through repeated showings of the same films, certain procedures become second nature. In combat some times "quick" thinking is not enough.

Besides, the demands of modern war are not all mechanical. The mental stresses are just as important. The mobility, the tremendous power of the highly mechanized units make the battlefields a scene of incredible noise and terror. The sounds, the clamor and din of battle play a large part in modern warfare and are a major consideration in the training of troops.

At the Signal Corps Photographic Center there has been established a sound school to which qualified candidates are sent for training in the use and care of sound equipment. These men are taught to use their sound equipment in the field and under battle conditions.

Here, too, is a modernly equipped and expertly staffed Sound Department that handles all the sound effects for the training films. It records and re-records dialogue, narration, music, and all the sound effects heard with the films.

In a training film entitled "Battlefield Sounds," troops are shown various weapons on the screen accompanied by the actual sounds made by each weapon from varying positions. The narrator says, "This is the sound of rifles at the point of discharge." The screen shows rifles at the point of discharge and the sound track gives forth the actual sound made by these weapons when fired. Then he says, "The Browning automatic rifle sounds like this at the receiving end"; or, "This is the way the thirty-sevens sound to the soldier under fire."

In a film called "Baptism of Fire" an attempt was made to dramatize common battlefield psychoses. Through the medium of the screen, the soldier is taken through his first assignment, from a bivouac area behind the lines to the final assault with the bayonet. Troops watching and hearing the action on the screen are in some measure prepared for the action when they are faced with it.

The Sound Department also maintains a library of sound effects and music.

During the past year there have been many notable achievements resulting from Signal Corps photographic activities. Outstanding among these is the expansion of the Latin-American division for the translation of training films and film bulletins into Spanish and Portuguese and Russian. These films are released to our Latin-American and European Allies as part of the Good Neighbor policy and the Lend-Lease program. The films serve to teach the officers and men in the Armed Forces of our Allies the use, care, and repair of American weapons and equipment which they receive on the Lend-Lease basis.

A selected group of men is being trained in still and motion picture photography at the Signal Corps Photo Center in Astoria, L. I.

Upon completion of their courses they are assigned as photographers (1) with mobile army units in the field; (2) to training film production units; or (3) for other uses as the War Department may direct.

Only those men who were professional photographers (preferably newspaper photographers or motion picture cameramen) or those who have the necessary background to enable them to learn how to become assistant cameramen quickly, are eligible for the photographic schools.

The photographic schools offer no basic training. Students are expected to be qualified photographers or cameramen before enrollment. What the schools provide are short adaptation courses with emphasis on military methods, procedure, and equipment, rather than on the science of photography.





These, too, are fighting flags of freedom . . . In ever-increasing numbers, flags like these fly over America at war. They are symbols of the strength of a free people, aroused in spirit, united in purpose. Battle flags of Victory today . . . they are won by the energy and skill that will build a better world tomorrow.

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Radiomarine Corporation of America, New York City, September, 1942—with one star for continued excellence.

RCA Laboratories, Princeton, N. J., May, 1943.

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Photography is used in the field for the following purposes:

(1) Provide news films and pictures for release to the public.

(2) Convey military information to the War Department and the Theater Commander of combat and Allied operations in the field. Combat photography is the primary mission of all units when opportunities occur.

(3) Provide Theater Commanders with military information of immediate tactical, technical, or strategic value.

(4) At the Theater Commander's request, convey information on personnel, materiel, conditions, and techniques for use by responsible staff agencies of the Theater and the War Department for development and proper use of all weapons and means of warfare.

(5) Provide historical pictorial records of the war.

(6) Cover projects which may, from time to time, be assigned by the War Department for the production of specific films for training, orientation, historical, or public relations purposes.

—30—

Pigeons

(*Continued from page* 248)

by Army pigeons—in a single major engagement. And in the closing phase of the battle, twenty-five additional messages of major importance were flown in by birds.

On the Italian mainland, General Mark Clark quoted a series of pigeon messages received at Headquarters from a Captain of a patrol out in front of the 5th Army. The first one said: "Surrounded on three sides." The second one said: "I am attacking." The last: "I've broken through."

In the raging battles of today pigeons are an integral part of the United States Army communication system.

As the younger men must fight the war, the younger pigeons must fly the messages. Military training begins for a pigeon at twenty-eight days of age. The older pigeons are retired from active service and must do their part on the production line; be mated and produce offspring capable of carrying on the heritage of their parents.

While it is the Army that flies its birds, and the Army that trains its birds, and the Army which must breed most of the birds seeing duty today upon the field of battle, it is the civilian pigeon fanciers to whom the nation must be grateful for much of the success of the Pigeon Service. When the Japs struck at Pearl Harbor and plunged the United States into total war, there was one active Pigeon Company and certain specialized detachments in service in the United States and insular possessions.

The nature of the war, the lessons learned from England and from Germany made it apparent that, in this conflict, as in no other war in the history of the world, pigeons would be needed—young, healthy, blooded birds to do a thousand specialized jobs. A call went out from the War Department to the civilian fanciers all over the United States: Pigeons were needed by the Army just as were needed the civilian's gasoline; the civilian's tires. A drive was started. It was sponsored by two great civilian organizations: The American Racing Pigeon Union and the International Federation of American Homing Pigeon Fanciers. Pigeon clubs took up the hunt and into the service birds began to arrive, their services volunteered by their civilian owners. These were more than ordinary homing pigeons; they were the offspring of champions possessing long pedigrees; some were champions in their own right, bearing certificates of their own records of six hundred miles in a single day. One shipment alone exceeded five thousand birds.

The pigeon in the Army, like his human civilian counterpart, undergoes an immense change as he begins to soldier. His home is changed, his habits are modified, his duties are new and strange. He must be especially trained and made to fit the specialized job he has to do. His duty varies with the branch of the service to which he is assigned. He may be in a jeep, or aboard a ship. He may fly with an airplane or in a blimp. He may be carried on a man's back or on a war dog's shoulders. Wherever the Army, Navy, the Coast Guard, or the Marines go, a pigeon may go with them.

What powers do pigeons have that they fly, so unerringly, to their base? Signal Corps Pigeoneers take the homing instinct for granted. It is probably about half "instinct" and half intelligence, for the pigeon is among the most intelligent of birds. Homers will endure over fifteen hours sustained flight to reach their home loft; they will cover the distance from Washington, D. C. to Chicago in thirteen hours (faster than train time). They will fly at a mile-a-minute clip, doing seventy-five miles an hour at their best. They will not stop for gale, storm, or lightning but will fly above or around atmospheric disturbances. They can go over seven hundred miles in a single day without rest.

Why do they fly home? Pigeons are almost human in their habits and desires. They know that food awaits them at home; also shelter and rest and the attention of their master. But most important, their mates are there, setting on eggs or squabs. The pigeon will remain loyal to one mate throughout life unless forcibly separated. Also he will live in one loft all his life, unless changed.

The homing instinct is not equally developed in all pigeons, not even in all homing pigeons. This urge is a matter of selective breeding and development by training.

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—30—

Visual Aids

(*Continued from page* 194)

potentiometer. It consists of a series of three links, one of which is permanently attached to the end of the potentiometer shaft, one to the end of the crank shaft, and the third is connected to these two by means of pins which permit free movement at the joints. As the hand crank is turned through a complete revolution the potentiometer shaft will be caused to travel through a portion of its normal swing then reverse itself and retrace its motion so that continuous rotary motion of the hand crank results in a to-and-fro movement of the potentiometer arm.

DEMONSTRATING VOLTAGE AMPLIFICATION

The triode amplifier demonstrator shown in Fig. 3 is also a development of the staff of the Southern Signal Corps School. In its physical makeup it will be recognized as incorporating some of the same ideas as the diode rectifier unit just described. Among these is the use of a hand-driven mechanical "generator" to supply a "signal" of extremely low frequency so that the variations of current or voltage in the various circuits may be readily followed by the meters, thus enabling the student to study visually the action in each portion of the tube circuit.

During tests of the first model some wit dubbed this training aid a "Mho Grinder" and the name stuck, because of the fact that, like a sausage grinder, nothing happens until the crank is turned.

The actual circuit diagram is shown in Fig. 4 and differs from the one shown on the panel in the substitution of a built-in power supply for the plate and bias batteries and in the arrangement of the input and output circuits.

The simulated "signal" is developed by means of the hand "generator" consisting of the potentiometer and battery in the tube grid circuit and the drive mechanism which includes the crank. This signal is then applied to the grid of the amplifier tube through the 25 μfd. capacitor, the prime function of which is to isolate the battery to avoid drain when the equipment is not in use.

The output circuit is effectively as shown in the circuit etched on the panel but actually is as shown in Fig. 4. By placing a milliammeter in the plate circuit of the 76 tube instead of using a voltmeter in its grid circuit, the tube provides normal operating load for the 6SJ7 amplifier tube but at the same time the static plate current of the 76 maintains the meter at mid-scale when no signal is applied. Thus its zero position is at center scale and when the signal is applied the pointer moves back and forth from this position, effectively conveying to the student the visual impression of alternating voltage.

Duplicates of this unit are prominently wall-mounted in each of the several laboratories where elementary vacuum-tube studies are carried on. Thus, they are always accessible to students. Further, it is a requirement that the students take advantage of them. This is accomplished by making a special fill-in quiz, dealing with the principles demonstrated by the board, a part of the vacuum-tube training material. Mounted beside each unit is an explanation of the demonstrated principles.

Important in electronic training is the phase reversal which takes place in a resistance-coupled amplifier stage. This is not always easy for students to comprehend but with the aid of these demonstration boards, becomes much more simple to many.

LOW-FREQUENCY TRANSMITTER

A low-frequency radio transmitter is being used at the Eastern Signal Corps Schools, Fort Monmouth, N. J., to overcome certain difficulties which have appeared in classroom instruction in this field.

While the teaching of radio presents problems as each new phase is entered, transmitters involve a special difficulty in that they lie entirely outside the experience of the average student. It is necessary not only to explain the functioning of the transmitter but also to convince him of the reality of the explanation—that the principles involved are fact and not theory. Every such attempt inevitably leads to a discussion of waveform. The plate current pulses in a Class "C" amplifier, harmonic distortion and frequency multiplication, and particularly modulation, all involve operations on the r-f wave itself. Although these phenomena may be expressed in a number of ways—in terms of instantaneous voltage or current or power—the summation of all such expressions is the shape of the wave.

The usual answer to this problem is the blackboard drawing, accompanied by a good many words. While this teaching method is probably indispensable, it is none-the-less inadequate, for two major reasons. First, a picture or verbal description of a sound wave, by its very nature, cannot carry one-tenth as much conviction as a single audible note emitted by a loudspeaker. Similarly, no black-





Photo courtesy U. S. Signal Corps

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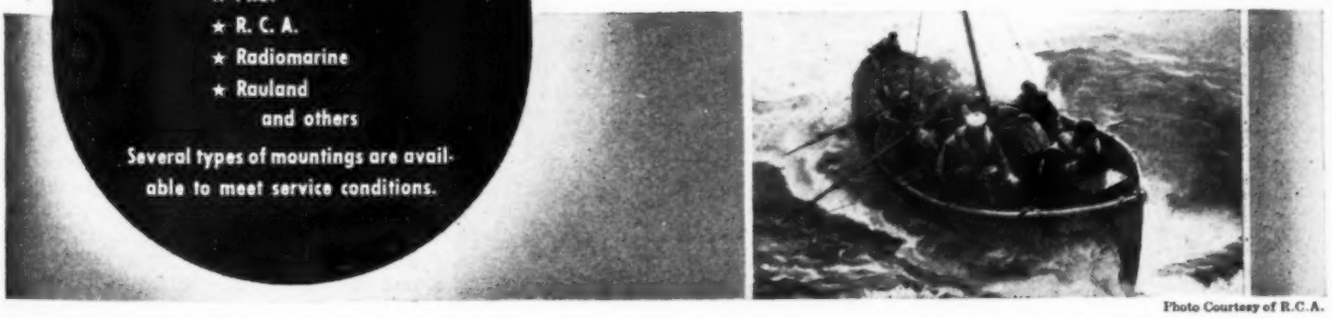
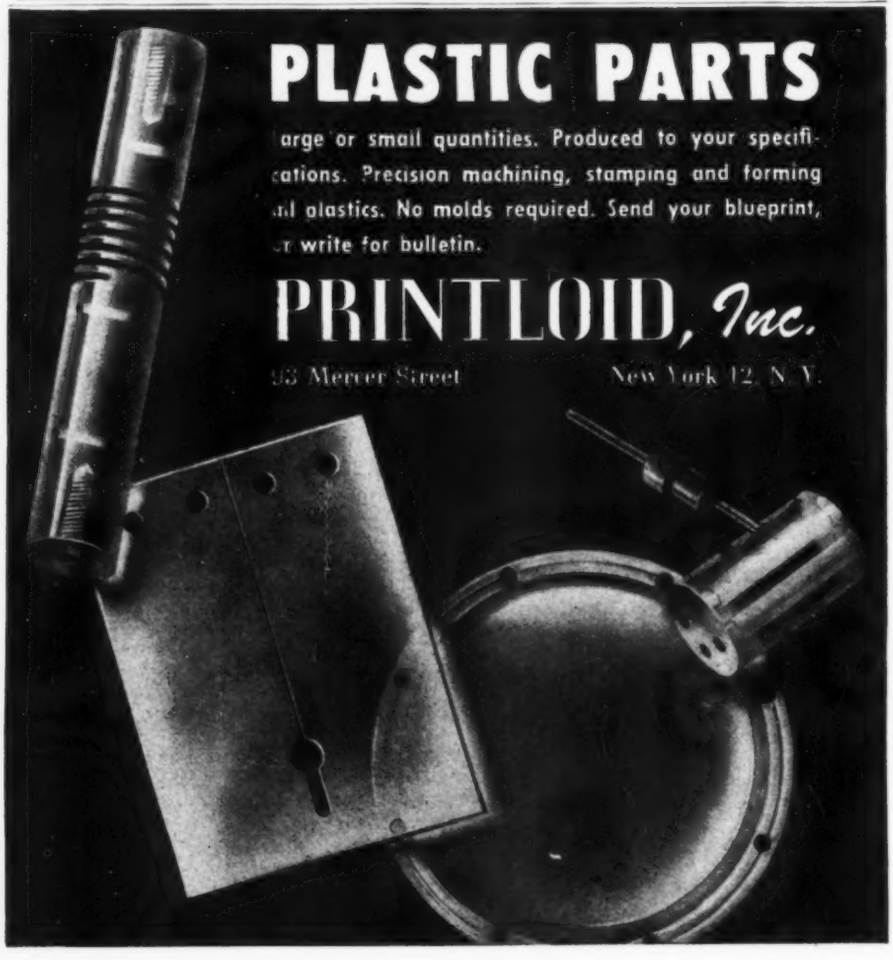


Photo Courtesy of R.C.A.





board drawing can equal an actual tracing drawn by the varying voltage itself on the screen of an oscilloscope. Second, blackboard pictures don't move. But the very essence of the developing waveform is motion. Since modulation involves motion, it is necessary to picture the variations of current and voltage in motion.

The obvious answer to these problems is the cathode-ray oscilloscope. But the application of the oscilloscope at the outset presents two problems of its own. First, since it is desirable to show the r-f wave itself, it is necessary to use a frequency low enough to be within the range of the sweep-frequency oscillator of the 'scope. With equipment available to this school, this means not more than 30,000 cycles. Second, it is desirable, in demonstrating the modulation, to show not only the r-f wave but also at least one complete audio envelope. This requires a ratio of r-f to a-f of not more than 15 or 20 to 1. For these reasons, it was decided to build a transmitter using conventional circuits but operating on a frequency of about 18,000 cycles. It was considered desirable to include a receiver capable of receiving this signal, so that the transmitter might be studied from the listener's point of view.

Fig. 5 shows the front of the board. The oscilloscope is centrally mounted so that it may be easily seen and accessible from all sections of the board. The transmitter section consists of a Hartley shunt-fed oscillator, a series-fed power amplifier, and a Heising class "A" modulator. In addition, there is a simple diode detector. Each section is distinctively colored. Most of the parts mounted on the front are actually used in the circuit. Some of the parts, notably the tank coils in all sections and the r-f chokes, are mere "window dressing."

The tank coils consist of a series of pies mounted on a common form. The actual chokes used are the secondaries of ordinary audio transformers. These, too, are mounted on the back.

While the circuit shown on the face is basically the circuit used, several changes were made in the actual circuit, in accordance with educational needs. All elements whose values are critical were made variable. In other instances, provision was made for shorting out a particular part to demonstrate its effectiveness in the circuit.

The actual circuit is shown in Fig. 6. This may be summarized under four headings—oscillator, power amplifier, modulator, and detector.

Oscillator

Grid bypass capacitor C_2 may be increased by switching in C_1 in parallel. Grid resistor R_2 is variable. The resistor R_1 is used to develop the pulsating voltage characteristic of class "C" operation. It should be noted that the cathode (ground) tap on the tank coil is variable. Note, also, that the plate lead is brought not to the top of the tank coil but a



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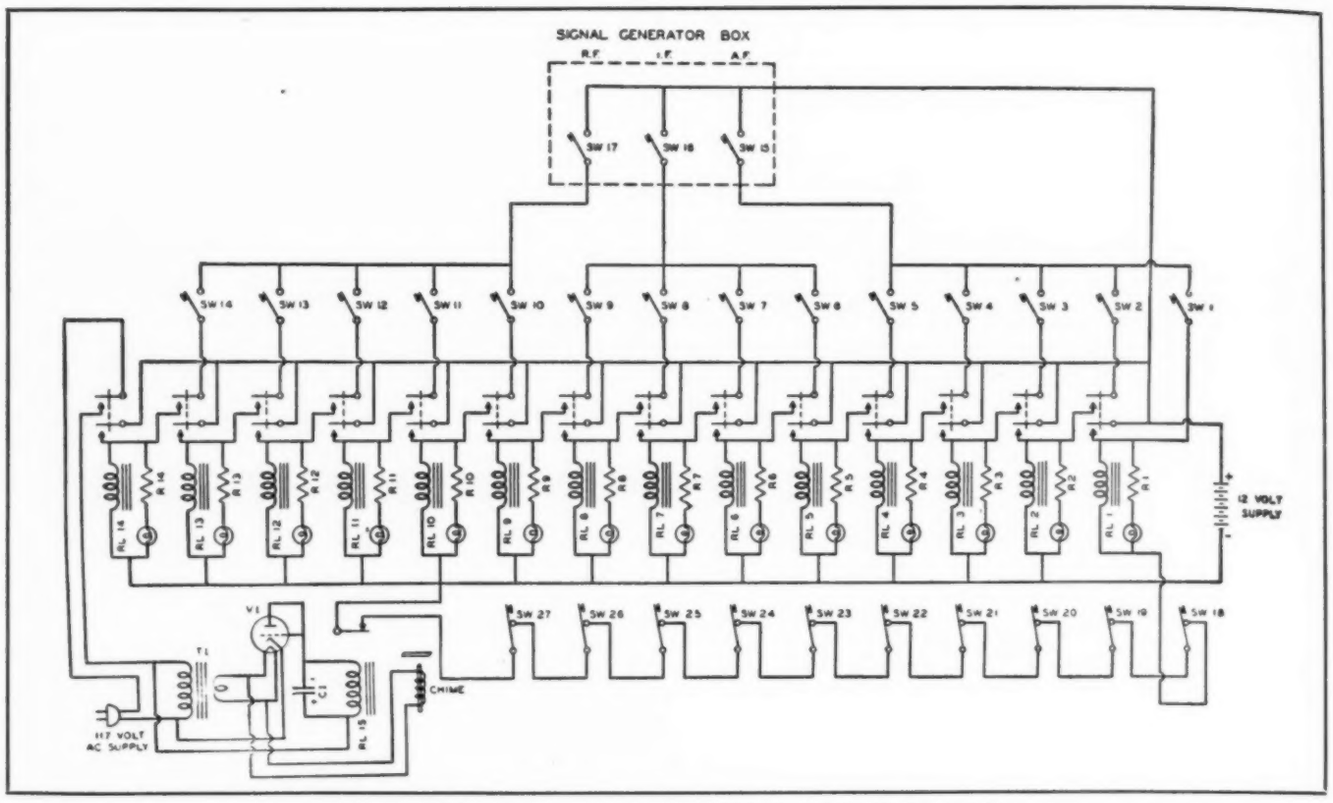


Fig. 8. Wiring diagram of the signal-tracing demonstration board.

little further down. The reason for this will be shown later.

In operation the scope leads may be placed across the tank. A sine wave appears on the scope. By varying the position of the cathode tap, the excitation is varied, as is the amplitude of the output wave.

If the scope is placed across R_1, the familiar picture of class "C" plate current pulses is seen. If the grid resistor R_2 is then decreased, the relative duration of the current flow increases, and these pulses broaden. If R_2 is given a high value and the grid capacitor increased by switching in C_1 the oscillator quenches and the quench pattern may be seen.

By means of an electronic switch, the patterns given by R_1 and the tank coil may be thrown on the 'scope at the same time to show the plate current flow at the peak of the tank voltage (grid excitation). In order to give the conventional picture, it was necessary to invert the relative phase of the tank voltages.

This was done by tapping the plate down on the tank coil and taking the voltage from there to the top.

Power Amplifier

Excitation feeds through blocking capacitor C_6. The power amplifier grid tap can be varied, thus varying the excitation and the load on the oscillator. Resistor R_3 is the variable grid resistor, while R_4 controls the fixed bias. Thus, the advantages and disadvantages of fixed and resistance bias may be shown. C_7 is the neutralizing capacitor. C_8 is the same size as C_7 and represents the grid-plate capacitance of the tube.

In the tank circuit, R_5 is a loading resistor which lowers the Q of the circuit. Even harmonic distortion resulting from rapid decay of the oscillation current, as well as the change in selectivity, can be shown.

R_6 is a load resistor which may be substituted for the tank circuit to show the plate current pulses. S_1 is a switch which shorts out half the tank inductance, and by thus tuning to the second harmonic shows frequency doubling. Capacitor C_{10} merely increases the size of bypass C_9, when it is desired to bypass lower frequency signals from the modulator.

Modulator

R_9 and C_{13} are the voltage dropping resistor and audio bypass, respectively. These may be shorted out to show the distortion which results from their ab-

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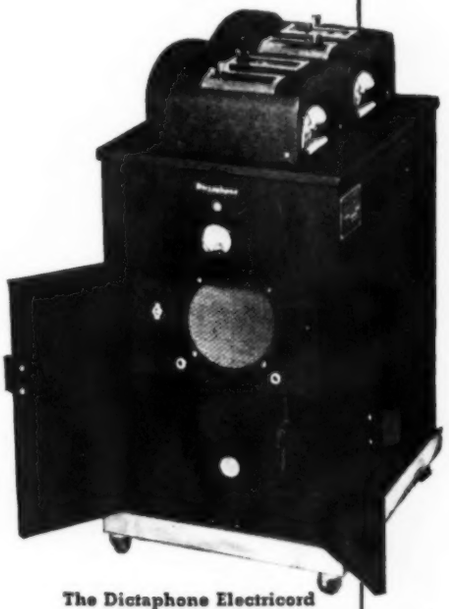


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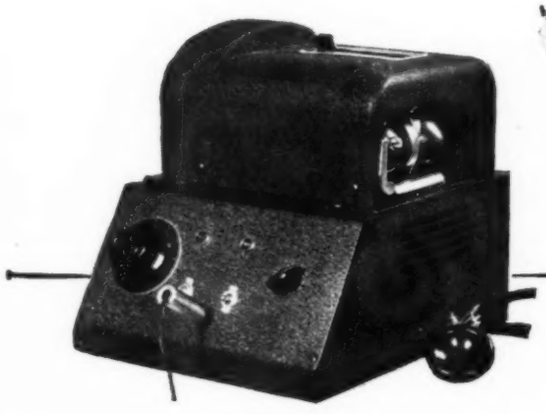
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sence. On the input side, the mike input transformer T_4 may be disconnected to allow feeding the output of the audio oscillator directly to the grid.

Detector

The tuned inductance L_8 is the secondary of an audio transformer. Varying the tuning of L_8-C_{14} changes the amplitude of the wave and is indicated by the 'scope when placed directly across the tank. The picture given by load resistor R_7 alone is that of the rectified signal pulses. Throwing in C_{15} filters out the r-f component, leaving the original audio signal.

The output of the detector feeds through transformer T_3 to the power amplifier. From there the signal passes through output transformer T_5 to the speaker.

SIGNAL TRACING UNIT

The training aid shown in Fig. 7 is one developed at the Central Signal Corps School, Camp Crowder, Missouri, to teach students in the Radio Division the proper method of rapid localization of trouble in a radio receiver that is not functioning. Students in this course have found this training aid interesting enough that the problem of teaching the student to trace such circuits has been greatly simplified.

The board consists of 24 push buttons (indicated by the small arrows that have been drawn in on the front-view photo, Fig. 7) placed at the various points on the diagram of a conventional superheterodyne receiver. Attached to the board by means of a three-foot connecting cable is a box labeled "Signal Generator."

Operation

The signal generator box has three push buttons which are marked "RF," "IF," and "AF." At the end of the board is a series of lamps in a vertical row with a thermometer painted around them. This is used as the student's "scoreboard." Assuming that the diagram is an actual receiver, the student is asked to locate an imaginary trouble in it by means of a signal generator. To properly localize the trouble, the student should use an audio-frequency generator to check the a-f section of the receiver first. By pressing the "AF" button on the Signal Generator box and the button at the plate of the last audio amplifier tube simultaneously, the bottom lamp is lighted in the thermometer. This lamp stays on when the buttons are released. This operation simulates checking the output transformer and speaker of the receiver. Pressing any other combination of buttons will not light the lamp in the thermometer. The next step is to apply a signal to the grid of the last audio amplifier tube. The student does this by again pressing the "AF" button on the signal generator box and the button on the grid of the last audio stage. With this operation the next lamp in the thermometer will light.

Should the wrong button be pressed, one of two things will happen. If a button is pressed where no signal is present at any time, such as the high voltage connection of the power supply, the lamps that have been previously "scored" will go out, requiring the student to start at the beginning again. Should he push a button where a signal is normally present but skip over an important stage, no lamp will light. Thus, for a good score, he must perform the trouble-shooting operations in the logical sequence. By pressing the "AF" button and the proper buttons on the diagram, he can simulate checking the entire a-f section of the receiver.

After he has progressed to the second detector, it will be necessary for him to use the button marked "IF" on the Signal Generator box. Using this button the student may check the entire i-f section of the receiver. Again if a button is pressed on the receiver where no signal is ever present, all of the lamps will be extinguished, requiring tracing all the previous work again. In this manner the entire simulated receiver is checked. When, after having tested all points in proper sequence the final button is pressed, all the lamps will be glowing and a chime will ring. After a delay of a few seconds, all the power will be removed from the board automatically. This feature was incorporated to prevent drain on the battery.

Function of Circuit Elements

Direct current obtained from a 12-volt storage battery and 117 volts alternating current from the commercial source are the sources of power used on the demonstrator. In order to light the first lamp, it is necessary to close switch 1 and switch 15 (see Fig. 8). This allows current to flow from the battery through the normally closed contacts of relay 15, through the normally closed switches 18 to 27 inclusive, through relay 1, switch 1 and switch 15, back to the battery. The bottom set of contacts as shown in Figure 8 will effectively short circuit switch 1 and switch 15 causing the relay to hold. The first lamp, being in parallel with relay, 1 will stay lighted. Resistor 1 is used to drop the voltage to the proper value for the pilot light. Should any one of the switches 18 through 27 be pushed next, relay 1 will not hold and the lamp will be extinguished.

As switches 1 through 5 are placed in the a-f section of the receiver, 5 lamps may be scored by pressing switch 15, then 1 through 5 in consecutive order. At this point it will be necessary to press switch 16 and switches 6 through 9 in consecutive order, so the next 4 lamps may be turned on. In like manner the remainder of lamps are caused to glow. At the moment the last lamp is turned on, the top set of points on relay 14 close the 117-volt circuit to the transformer 1. The 6.3-volt secondary of this transformer will cause the chime



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to ring indicating that the student has completed the signal tracing successfully. The cathode of the vacuum tube will then begin to heat and when it has reached operating temperature, it will rectify the line voltage, causing current to flow through the normally closed relay 15 which releases all relays and opens the 117-volt and the battery circuits. -30-

Mediterranean

(*Continued from page* 152)

the task forces and General Eisenhower's headquarters, thence to the higher command in the United States and England.

It was a complex setup, because elements of the United States Army and Navy, the British Army and Navy, the Fighting French, and the Air Forces of each of the elements were involved. Combined codes and ciphers had to be arranged, with systems of identification and authentication, so that fake messages from the enemy could be recognized. Radio frequencies and call signs were completely reorganized.

No minor factor, either, was the logistical planning, which provided methods of supply to keep pace with a rapid expansion of the signal communications system.

Finally came "D Day," November 8, 1942—and the combined Allied Forces struck simultaneously at various points along the shore of Northwest Africa.

It is a matter of history that the operation was successful. Coordination among the British and American naval and covering air forces was characterized by military sources as "magnificent"—a tribute to signal communications.

Signal units landed with the assault units and established communications with the aircraft and the centers of command. They were trained teams which had carefully studied the existing communication systems in Morocco and Algeria, with a two-fold function—instant severing of enemy wire lines, and the seizure of telephone exchanges, telegraph offices and radio stations for use by the Allied Forces.

Signal communication rehearsals had continued during the trip across the ocean for the invasion. Emphasis was placed on the training of men handling the main Signal Center, located for the first few days aboard one of the accompanying warships.

During the landing operations a naval gunnery officer and army radio operators with a portable radio set accompanied each assault battalion. Thus the supporting naval gunfire was directed and observed, until the arrival ashore of field artillery units. Air support was provided by naval planes from aircraft carriers, communicating with the assault units ashore, which used a radio in a quarter-ton vehicle.

Acts of heroism by Signal Corps personnel were commonplace during the landings.

At one hotly disputed point near Casablanca, Pvt. John M. Smolkovich yanked a .30 caliber machine gun off a landing boat, set it up on the beach and downed an attacking enemy plane. His Signal Corps detachment landed with the first wave and fought Infantry style throughout the day until their communications equipment was landed. Their carbines and the commandeered machine gun furnished the fire power for the protection of their sector of the beachhead.

Sgt. Lorenzo Alcock, a Signal Corps movie cameraman, was later decorated with the Silver Star for his work that day. Sgt. Alcock was perched on a destroyer's bridge entering a French Moroccan port when a dock searchlight suddenly focused on the ship and shells began exploding around it in all directions. The sergeant remained exposed, photographing the entire action. Upon landing he marched into town with the first Infantry wave and kept grinding his camera until he discovered he was running short of film. Starting back to the boat for more of the precious celluloid, he encountered heavy crossfire. Instead of fleeing, he jumped behind a large rock and from this shelter proceeded to take more pictures with his remaining film.

The carefully selected signal equipment (more than 10,000 different Signal Corps items were shipped to North Africa) came in for a good share of the glory. At one place a rubber scout boat was guiding two destroyers by means of a signal light through a safe channel into the harbor of Safi. The first destroyer got through quickly, but the second apparently failed to see the guiding signal light and headed for the breakwater rocks. It happened that the comparatively new "guidon" set, a portable two-piece transmitter and receiver, was in the scout boat, another on the destroyer. The men in the boat hurriedly radioed a warning to the destroyer, which corrected its bearings, came safely through, and the harbor was soon in our hands.

Radio also figured in the use of another powerful weapon—propaganda—which lessened French resistance and contributed to the success of our landing operations.

The use of this weapon had been planned ahead of time. As soon as the operation plan was completed and approved, the Signal Corps War Plans Division, Office of the Chief Signal Officer, figured the equipment and personnel needed for its execution. The Army Communications Service, within five days, purchased, modified, and installed a five-kilowatt broadcasting transmitter on a battleship. Military Personnel Division assembled the technicians—assigned a well-known radio announcer of the Signal Corps.

On the morning of the landings the battleship hovered off the coast, within effective distance for clear transmission, and began broadcasting to the populace of Northwestern Africa. The Army station broadcast President Roosevelt's message to the French peo-

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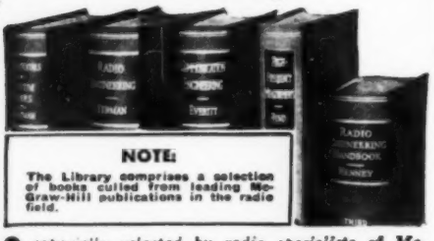
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ple, General Eisenhower's instructions to French troops willing to cooperate with the landing forces, and General Honore Giraud's appeal to French soldiers. Between announcements, interspersed with the latest news from various African battlefronts, the station played music with "La Marseillaise" predominating.

The station continually called upon the French to lay down their arms. At one period, when our naval forces off Port Lyautey decided to open up with big guns against shore objectives, a special communique was broadcast so that civilians could take cover.

United States signal equipment was, without a doubt a large factor in the North African victory. A recent report by Captain James P. Lipp said that German radio equipment was "five years behind our own." The Germans, he declared, standardized their radio apparatus during the 1934-1938 period and attempted no further improvements.

"The captured German sets we tested," he said, "were certainly not made for Africa. They lacked waterproofing and were not dust-proofed. An obvious fault was the lack of impregnation of coils and transformers to keep out moisture."

Our own planning and engineering, meanwhile, paid rich dividends. A new series of radio sets procured by the Signal Corps since Pearl Harbor proved highly successful. The tiny handie-talkie, a five-tube transceiver, was especially popular with combat patrols and other front-line troops who praised its simplicity and dependability. The versatile "guidon," a portable transmitter and receiver for use on horseback, in a vehicle, or on the ground, is another radio set which withstood the test of combat.

Radio sets for armored organizations, designed by Signal Corps engineers to overcome interference due to static and other disturbing background noise, also came through with flying colors. The frequency-modulated sets, improved tremendously since the United States entered the war, were built sturdy enough to withstand the shock of large caliber gunfire. One type of tank sets featured push-button tuning, which not only enables the operator to select his channel instantly, but also guards against detuning as a result of dial shift caused by vibration.

The more powerful SCR-299 radio set, a mobile headquarters radio station, proved to be one answer to the problem of long-distance communication involved in the African campaign.

As soon as our forces were firmly established in Africa, work was begun by the Army Communications Service, Office of the Chief Signal Officer, on the most important single Signal Corps installation in the African Section. More than a thousand boxes of equipment, ranging in weight from seven pounds to twenty tons, were shipped to Algiers, where there was set up a transmitter powerful enough to maintain direct communications with the United States.

Signal communications equipment played an important part in the brilliant work done by the Artillery. During the Tunisian campaign one corps Artillery officer commented:

"We have such good communications we can lay down concentrations of artillery fire at any point at any time, and there isn't much that can come through alive."

The mass artillery firing technique required good signal communications. Field wire was strung as far forward as possible, over routes where it was not likely to be torn by tank tracks or shell bursts. At the same time, the area was covered by parallel radio communications as an alternate means of communications, should the wire lines go out, while beyond the area covered by wire, radio was used almost entirely.

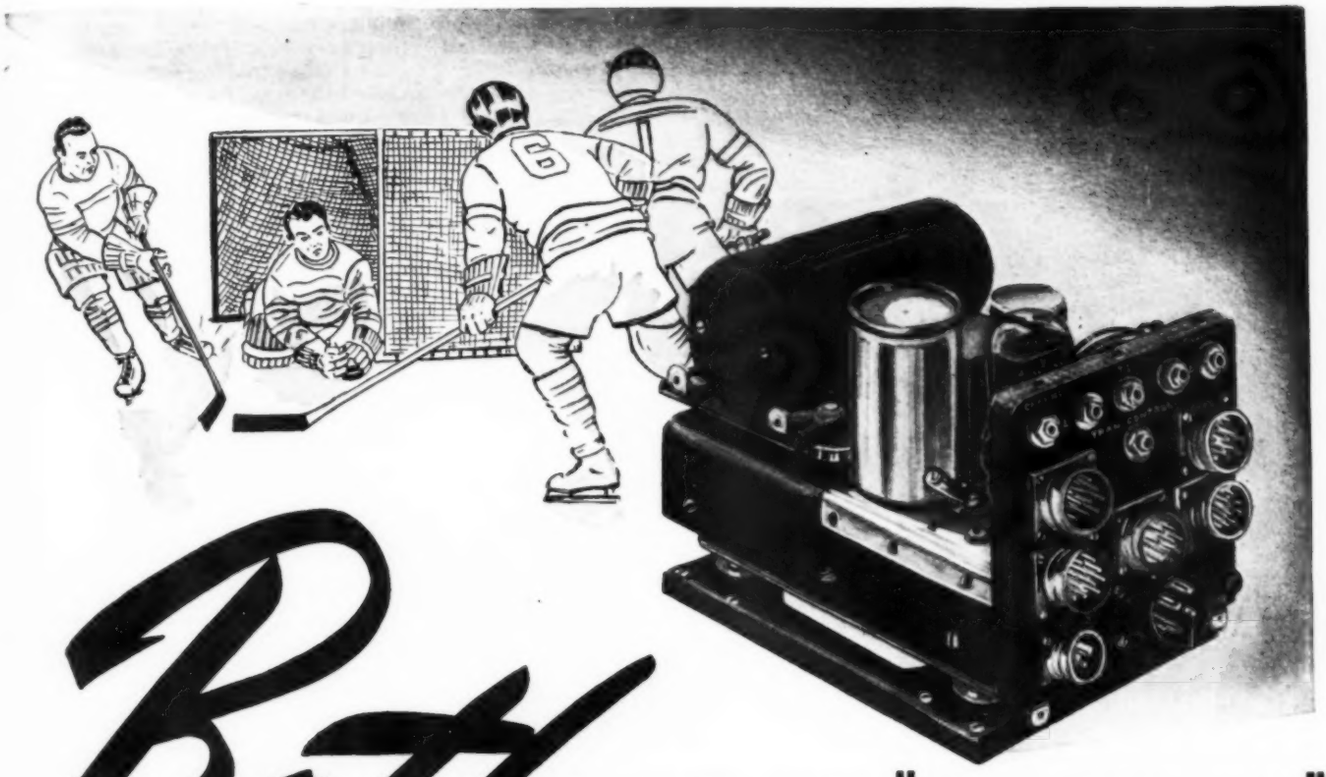
Attesting to the efficiency of the Signal Corps system was an incident of an Artilleryman's ingenuity. Our forces drove north of Lake Achkel, west of Bizerte, until the advance was stalled by German batteries. Our own battery was in a position to fire, but was unable to find a suitable point for forward observation. South of the lake from the crest of Djebel Achkel, which we had just taken, other American combat units without artillery support could see the German gun positions. Direct communications had failed between the Americans west of Bizerte and the crest of Djebel Achkel. An enterprising observer on Djebel Achkel routed a telephone call over signal lines back 100 miles to a switchboard and thence forward along another circuit to the Yank guns north of the lake. In a few minutes the American batteries adjusted their fire and began dropping shells on the enemy gun positions. The Germans withdrew hastily, and our advance continued.

A classic example of Signal Corps performance in the thick of battle is the story of Lt. David C. Buscall, Jr., of Silver Springs, Maryland, who won the Silver Star for his "calm and courageous conduct" during the battle of Kasserine Pass.

Lt. Buscall not only managed to maintain communications under severe fire, but he stuck to his post even after the counter-attacking enemy had surged past the town of Sbeitla in which Lt. Buscall and his crew were operating a signal center. Then, refusing to give up, he succeeded in evacuating all personnel and equipment—even to a French switchboard which he loaded on the hood of his jeep.

The lieutenant told later of establishing the center in a blackout, and of a group of wire crewmen who constructed a thirty-mile circuit under heavy shellfire directly behind the the front lines from Sbeitla to Sidi-Bou-Zid.

"Trouble on lines was frequent," he related, "due to bombing and strafing. On several occasions our main link was cut by bombing, but immediately our



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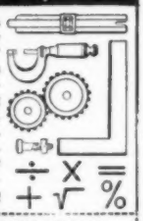
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radio set was put on the air and stayed there until the wire trouble was cleared. At no time did the radio fail to reach the main signal center."

Soon it became apparent that the American situation in Sbeitla was critical.

"On 16 February at 1900 hours," an officer wrote, "an artillery duel could be plainly heard from our message center. At about 2100 hours French soldiers who operated the telephone exchange at Sbeitla came over and wanted to borrow some incendiary grenades to destroy the civilian switchboard.

"After contacting the corps signal officer, they were instructed to remove the switchboard and set it on the sidewalk for us to pick up. Toward midnight the artillery fire increased in intensity and machine gun fire became louder. After this, many American tanks were seen retiring west of Sbeitla. At that time trouble was being cleared on some of the local circuits that had gone out." At 1:30 a.m. Lt. Buscall sent most of his messengers and wire crewmen back, keeping a skeleton force to operate the center.

"At that time we started to cut our circuits over, but hardly had we started when the ammunition dump, about 100 yards away, blew up. We continued to connect lines and sort out circuits after we found out what the explosion was. These explosions continued. Finally about 0300 hours we completed our cutover and were loaded.

"Left Sbeitla about 0310 and passed the P.T.T. (French Telephone Company) building. The switchboard was on the sidewalk but our truck had not come back, so the switchboard was loaded on the hood of my jeep, and we continued on. At the time we left, many machine guns were firing approximately 600 yards east of Sbeitla. The ammunition dump was still exploding. The whole sky was red. Several buildings were on fire. We finally arrived at 0445 hours."

As a sidelight to the affair, one of Lt. Buscall's messengers, watching the battle from a rooftop, noticed a battery of Artillerymen trying to evacuate their guns. The messenger volunteered his assistance, helped get the guns out, and returned to his duties.

Elsewhere, too, Signalmen were having an exciting time. In the battle of El Biar, Algeria, American forces were fanning out and mopping up resistance. Lt. Albert Klein, a combat photographer, chanced upon an enemy machine gun nest, heaved in a hand grenade to wipe out the position, and nonchalantly took pictures of the rubble.

Edward W. Beattie, United Press writer, told of meeting Lieutenants Sam Center and Wendall Boston "between the American jumping off place and Gafsa."

"They were searching the countryside with a crew of veteran telephone men," he wrote, "picking up mines and getting poles for their lines."

At another place Cpl. Samuel Balish of the Signal Corps found 75 native soldiers and a French officer asleep in their barracks. Balish awakened them, gave them some American cigarettes, talked them into surrendering and imprisoned them in a nearby railway station.

Lt. Robert Philips and three enlisted men were working on communication lines when two Junker 88's attacked. A bomb exploded a few feet away, shattered Philips' right arm and wounded the others. He drove a truck six miles to an aid station and dispatched an ambulance to the scene.

Pvt. Milton Peterson and six others were on their way to the front to repair tank radio sets in Tunisia when they were ambushed by German paratroops with a machine gun.

"I was hit as I jumped out of the truck to take cover," Peterson said, "A bullet entered my left side, went through the stomach and right arm."

As the Signalman sprawled in a ditch covered with blood from a scalp wound, he saw his comrades taken prisoner but the Germans left him for dead.

Everywhere the Signal Corps, with typical ingenuity, met and conquered spur-of-the-moment problems that developed as the campaign progressed. At Tripoli dust clogging of wheels, keys, joints, and springs of teletype machines created a real trouble for the maintenance men.

"It's quite a problem," reported Major Louis J. Simonich, "but by good hard work and sweat Signal Corps men are overcoming that obstacle."

A common sight on the North African landscape was a symbol of Allied unity—a single telephone pole carrying the distinctive cross-arms and insulators of the French, British, and United States manufacture. When circumstances interfered with other means of communication, the Signal Corps fell back on the centuries-old method of pigeons. In one battle pigeons delivered some forty-five urgent tactical messages. A pigeon named "Yank" bore the first news from the front of the recapture of Gafsa, flying twenty miles in bad weather. Time and again the Signal Corps began installing signal communications before the staff had completed its tactical plans.

Col. T. J. Tully, a corps signal officer, wrote in a report:

". . . Success is due mostly to a thorough anticipation of a damn good guess as to what somebody else will decide later. . . . If the Signal Officer waits . . . it might be too late."

Writing under fire during a crucial Tunisian battle, Col. Tully gave a graphic account of field operations:

"As I dictate this letter in our field set-up here in the woods tonight at 2200 o'clock, we are in the midst of a very mobile, very fast moving operation with a very fluid front. This operation might be compared to a football game where the Corps Command Post is in the position of quarterback, well back of the line of scrimmage, di-



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recting a play with its full force on end of the line; and then, without waiting to call a new set of signals, the play is suddenly shifted to the extreme opposite end of the line —some dozens of miles across from end to end.

"At the moment, the corps wire officer is making his shifts of circuits by a series of telephone calls to various key points where, with the aid of an interpreter, he hopes to switch over the connections necessary to insure telephone and telegraph service at the other end of the lines for the major units within the next three hours.

"The corps radio officer is also at the phone arranging details to cover emergency radio communication on one end of the line where the enemy has suddenly withdrawn and where communication at the moment is rather uncertain, since wire installations had not been entirely completed.

"Corps radio, wire, teletypewriter, and message center teams are moving at this moment to the other end of the line, to an advance Corps Signal Center being established there from which we will give more detailed instructions to the teams later tonight as the tactical plan unfolds. Our message center people are planning the revision of their scheduled messenger runs to take care of the new developments. By midnight we hope to have both ends of the line well in hand."

Fast and thorough planning, then, was a keynote of Signal Corps success; North Africa, however, was only the first chapter in the Signal Corps' performance in the Mediterranean Area.

Signalmen were in there pitching as the Allies swept over Sicily.

The Signal Corps was there, too, when the Allies landed at Salerno and opened the main Italian campaign.

And—the Signal Corps will be there when United Nations forces smash into Germany itself.

—30—

FM in World War II

(*Continued from page* 243)

of a major investigation undertaken by the Signal Corps three years before Pearl Harbor. When the treacherous Japs struck, the Signal Corps was ready with new and modern radio sets which could be placed into mass production with the least possible delay.

In the fall of 1937, when the triple-crossed steel tower of Major E. H. Armstrong appeared on top of the Palisades near Alpine, New Jersey, to begin what later turned out to be a new era in radio, it was evident to Signal Corps engineers that this "thunder-defying" type of communication, as FM was popularly called, was able to offer far more than crystal clear, staticless reception to homes within a 50-mile radius. These same technical characteristics, it was believed, might well transmit a clear message to a tank in battle through the severe ignition interference and track static, produced by a dozen or so machines in column. If so, FM would be a military weapon fully as effective as any produced for modern coordinated warfare. With this in mind, the Signal Corps began a series of tests and experiments to find if FM was perhaps the answer.

Active coordination of information was begun with the General Electric Company, which, working closely with Major Armstrong, conducted a series of FM demonstrations in April, 1939, for the benefit of engineering representatives of all interested Government departments. Under the direction of Major General Roger B. Colton, the Signal Corps Laboratories sent engineering representatives to witness these tests and make recommendations as to the military value of FM. As a result of the recommendations submitted, the author was assigned the task of designing the first mobile FM radio set.

This FM set was included on extensive demonstrations of new communications equipment for the Mechanized Cavalry at Fort Knox, Kentucky.

Those were critical times. The world was just waking up to the fact that modern warfare was different. The Mechanized Cavalry, then only a Regiment, had just recently returned from the Plattsburg maneuvers while

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Hitler's panzer divisions were completing the conquest of Poland. Our Army was busy streamlining its organization and changing its tactics to meet the lessons of Blitzkrieg.

The Mechanized Cavalry promptly became the Armored Force and expanded to many divisions. It was fully conscious of its need for the very best in radio communication equipment in order to carry out most effectively its fast, hard-hitting missions. It very shortly submitted to the Chief Signal Officer its military requirements for a series of radio sets to provide mobile radio communication to all Armored Force units. This series of sets varied from a long-range, 400-watt "truck" set to a short-range, 1-watt pack set.

The Signal Corps Laboratories began immediately to translate these military requirements into technical characteristics and to rush through to completion development models to be thoroughly service-tested before large scale production could begin. In the advantages of FM seemed to lie the answer to the Armored Force's requirements for short-range voice radio communication. However, before the Signal Corps could embark upon such a radical program, these advantages had to be proven beyond a shadow of a doubt. Many avenues of investigation were begun. It was highly desirable that the decision should not rest upon technical considerations alone; therefore, it was determined that identical sets, one AM, the other FM, should be developed and tested by the Armored Force under the same field conditions. Toward this end development of two types of radio sets were undertaken, one a rugged push-button tank set, the other a small, lightweight pack set. For both types both AM and FM models were completed.

In the meantime, commercial concerns were now manufacturing FM mobile police radio sets and the Connecticut State Police was installing the first FM police system. The Signal Corps Laboratories sent officers and engineers to make a thorough study of the operation of this equipment. As commercial FM police equipment became available, identical models in both AM and FM were procured and subjected to thorough analysis and comparative tests. The average results of these tests showed that FM had a range advantage over AM of 3 to 2 under identical operating conditions. At extreme range FM was 4 to 3 above AM in intelligibility, while at medium range FM was 3 to 2 over AM in intelligibility.

The Signal Corps was satisfied. The development models, both FM and AM, were now available for tests. They were taken to Fort Knox, Kentucky, and installed in tanks and other combat vehicles and subjected to gruelling tests under all conceivable conditions. *The verdict was FM.*

These two models were immediately put into large scale production and are now found on all American fighting fronts where they arrived on time and in sufficient quantities.

After adoption by the Armored Force of FM sets, other requests came pouring in to the Signal Corps from all other branches of the Army. These were speedily met by the Signal Corps Laboratories working in close cooperation with an indefatigable industry until now FM constitutes a great proportion of the Army's radio communication system.

The time has not yet arrived when it will be possible to divulge the complete details of FM developments, but it can be said that many vital strides on the road to victory were made possible by the developments FM contributed by both the Signal Corps and radio industry. The development and investigation of new ideas in radio is still in progress by the Signal Corps Laboratories and will, no doubt, have a most profound and beneficial effect on postwar activities of the radio industries.

—30—

V-Mail

(*Continued from page* 127)

soldier overseas receives around forty letters per month and that V-Mail saves ninety-nine per cent of the weight and space occupied by regular mail, then the contribution of this function to a quicker victory becomes apparent.

V-Mail effects a seventeen-to-one reduction in the size of letters in transit. The letter is written on paper eight and one-half inches by eleven, sent overseas on film one-half inch by five-eighths of an inch, and then transferred to a readable print four and a quarter inches by five and a half.

On 100 feet of 16 millimeter film, 1800 letters can be photographed and carried across the sea in a small box weighing less than seven ounces and displacing only sixteen cubic inches. Send 150,000 one-sheet letters by ordinary mail and they will weigh 2,575 pounds and require the space and use of thirty-seven mail sacks. Send the same 150,000 letters by V-Mail and the weight is only forty-five pounds, occupying the space of only one sack of mail.

The V-Mail Section of Army Pictorial Service, which is responsible for the processing, has now achieved, and is maintaining, its goal of processing all mail leaving or reaching the United States within twenty-four hours. This means that despite the gigantic volume of letters flowing through V-Mail centers, an outgoing missive will be photographed and on its way and an incoming letter will be transformed from film to readable form and dispatched, within a full day of their receipt.

The boast of the V-Mail Service is that it has never lost a letter.

V-Mail is impervious to the hazards

Listening Post!



ALEX. E. GORDON, Indianapolis, Ind.— legislative representative of the Brotherhood of Locomotive Firemen and Enginemen— brings good news to hundreds of mothers of missing servicemen, through his hobby and his faithful 16-tube, 1940 model

MIDWEST RADIO

ALWAYS a short-wave radio enthusiast, Alex. E. Gordon has spent many a night listening over his 16-tube Midwest Radio to foreign broadcasts. Several months ago he noticed that the Nazis, along with their propaganda, were mentioning the names of a few American prisoners each night. Mr. Gordon began to jot down the names and sent postcards to the parents of the men named. The response to these cards was so instantaneous and gratifying that Mr. Gordon induced others to join with him in a Short Wave Listeners Club—each member of which is allotted a definite time at his listening post.

Mr. Gordon feels that he is amply repaid for his trouble by such grateful expressions of appreciation he has received: "It is a patriotic service for which I cannot thank you enough" . . . God bless you for your kindness" . . . and other similar statements received by this Midwest Radio owner.

Just another case where a Midwest Radio, famous for its ability to pull in long distance stations even under the most adverse conditions, is doing yeoman duty, until Victory will permit us to turn from our production of radio and electronic devices for our Armed Forces and resume the manufacture of finer radio receivers—at lowest Factory - To - You prices and at savings up to 50%.



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NAME.....

ADDRESS.....

CITY.....STATE.....

of war. Sunken ships, fallen planes, and all forms of destruction can mean at most, delay to V-Mail. Original letters are always kept until their reproductions reach their destination. Thus it was that when the Lisbon Clipper crashed with 110 rolls of V-Mail film, every letter in those rolls was on its way again on another plane within a short time.

The Army itself has learned to rely on this system that was originally designed for the personal use of its soldiers. The War Department has adopted a modified form of V-Mail for carrying official documents and communications. Called Official Photo Mail, it differs from V-Mail only in that final reproductions are enlarged to full size instead of the four and a quarter by five and a half inch reproduction used by V-Mail.

A complete photo mail station and laboratory is maintained in The Pentagon in Washington for the processing of this Official Photo Mail. It is equipped with outsize cameras for micro-filming large blueprints, maps, sketches, plans, and diagrams. In conjunction with it, the Signal Corps runs a training school for V-Mail technicians.

The Adjutant General's Department, which conducts the Army Postal Service and, except for the processing, operates the V-Mail system, has also put micro-filming to work reducing the multitudinous, space-consuming files of the War Department. The contents of 5,000 four-drawer file cabinets have been microfilmed to clear War Department space. The documents that they contained are still available on the film, which can be read on a "reader" that projects an enlarged picture of the document on a glass screen. More than eighty high-speed cameras capable of taking 500,000 pictures a day are used.

Ordinary V-Mail is processed largely through commercial contract. Processing stations are maintained in the United States, the Southwest Pacific, New Zealand, Hawaii, the European Theater, and the Middle East. In other places, V-Mail processing centers are operated by the Signal Corps.

Processing V-Mail in a theater of operations in some out-of-the-way corner of the earth, under extreme conditions of blazing heat or biting cold, with water scarce, fluctuating power sources, and sometimes without essential equipment, taxes the ingenuity and perseverance of Signal Corps personnel but every station started, is functioning today despite handicaps.

In one place supplies had to be kept dry despite a humidity that remained constantly around ninety per cent. In another, the thermometer registered regularly around 167 degrees and the emulsion ran off the film. That obstacle seemed insurmountable until refrigerators were sent to the unit and a system was devised of shipping an adequate supply of film in the winter to be stored the year around in the refrigerators.

In one of the Southwest Pacific stations, the Signal Corps men installing a V-Mail station found that they would need a big water tank that hadn't been anticipated. To obtain one from outside their isolated post, would mean a long delay. It may look rather odd up there on dry land but today there is a sawed-off marine buoy serving as a water tank for the V-Mail station.

The North African V-Mail station was set up in a wheat field, sheltered for the most part in discarded packing cases and temporary wooden structures, that had been used in converting a freight ship to a troop transport.

Outgoing letters reaching a V-Mail station are opened by machine and fed into a recorder at an average rate of 1200 per hour. The average allows for time for such things as adjustments and replacing of burned-out lights. Maximum capacity of the machine is over 2,000 per hour.

As the letter feeds into the recorder it makes a contact that turns on the photographing lights and starts a new frame of the film reel moving synchronously with the letter to make the photograph. The letter is swept beneath a comparatively narrow strip of light, photographing a small portion of it at a time, although the movement is so rapid as to appear instantaneous.

After each 100 letters a "target" letter is fed into the recorder, bearing a number. Then, if the microfilming of any of the letters is found to be faulty during inspection, the originals of the faulty letters can be easily located by the numbers on the "targets" and put through again.

The long strips of exposed film are next put into a machine that develops, fixes, and washes them in a continuous process. This is accomplished at the rate of approximately 100 feet of film every half hour.

Inspectors then view the film greatly enlarged on projectors but at such a rapid rate, that they are able only to determine the quality of the photography and cannot read the contents of the letters.

The film is then packed for shipping.

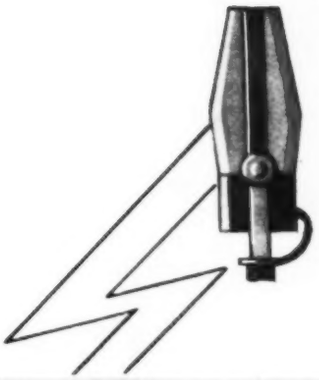
Letters that have been shot are placed on file to be destroyed when word has been received of the safe arrival of their recording film.

Incoming film is inspected and measured on a densitometer, which determines its exact density. From this can be computed the precise amount of light and stop opening for the enlarger.

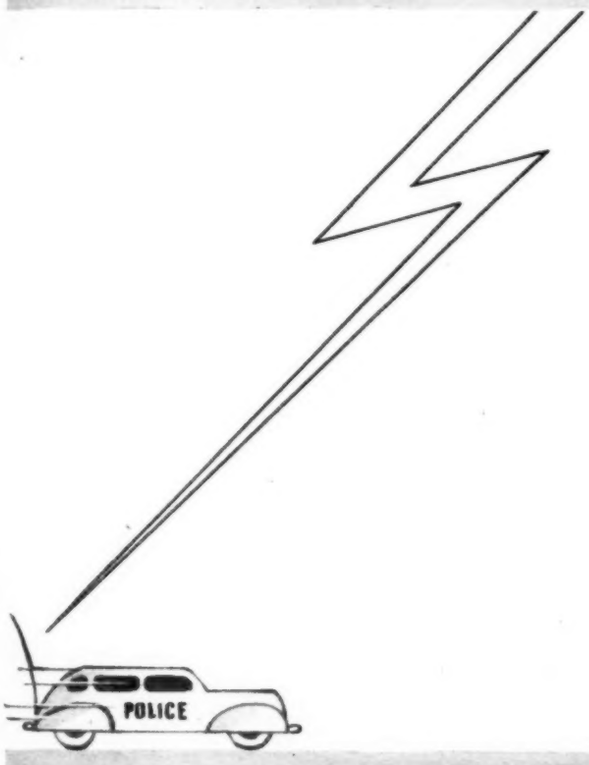
Enlarging, too, is a continuous process. Film feeds through the enlarger at a fixed rate while below it, on the enlarging board, a roll of sensitized paper feeds through in an opposite direction and at a rate of speed geared proportionately to the film. They move in opposite directions because of the lens' inversion of the image. A hundred feet of film prints on 825 feet of paper.

The paper is then run through a





"Calling Car 29 ... Car 29" "OK - ON THE WAY!"



Police radio installations have for some years depended on the Browning Frequency Meter for help in determining the accuracy of fixed-frequency operations. Police departments have found this unit economical to buy, easy to operate, and ruggedly built. Other emergency services have also found this product of Browning Laboratory research to be an asset. Full details are available in literature sent upon request.

Another product of Browning Laboratory research is the balanced-capacitance Browning Signal System for plant protection without armed guard patrols. Descriptive literature is available on request.



BROWNING
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continuous processing machine that develops and washes it, while more machinery dries it at an accelerated rate.

Next, paper is chopped into individual letters. This step is the only one that has not been successfully mechanized to the fullest extent. The black rectangle at the bottom of V-Mail letters was originally designed to enable a photo-electric cell to chop the paper at the proper point but the photo-electric cell proved unsatisfactory. Automatic determination of the chopping point had to be abandoned. The chopping itself is still mechanical, although controlled manually. But machines take up again in folding the letters and inserting them in the envelopes, ready to be delivered to the addressees.

Th United States Armed Forces Institute at Madison, Wisconsin, conducts most of its overseas correspondence courses by Official Photo Mail. The blanks on which the student prepares his lessons are designed for transmittal to Institute Headquarters and return to the student by Official Photo Mail.

All V-Mail travels by plane, which brings it into the United States within eight days from Karachi, India, and within seven days, from North Africa.

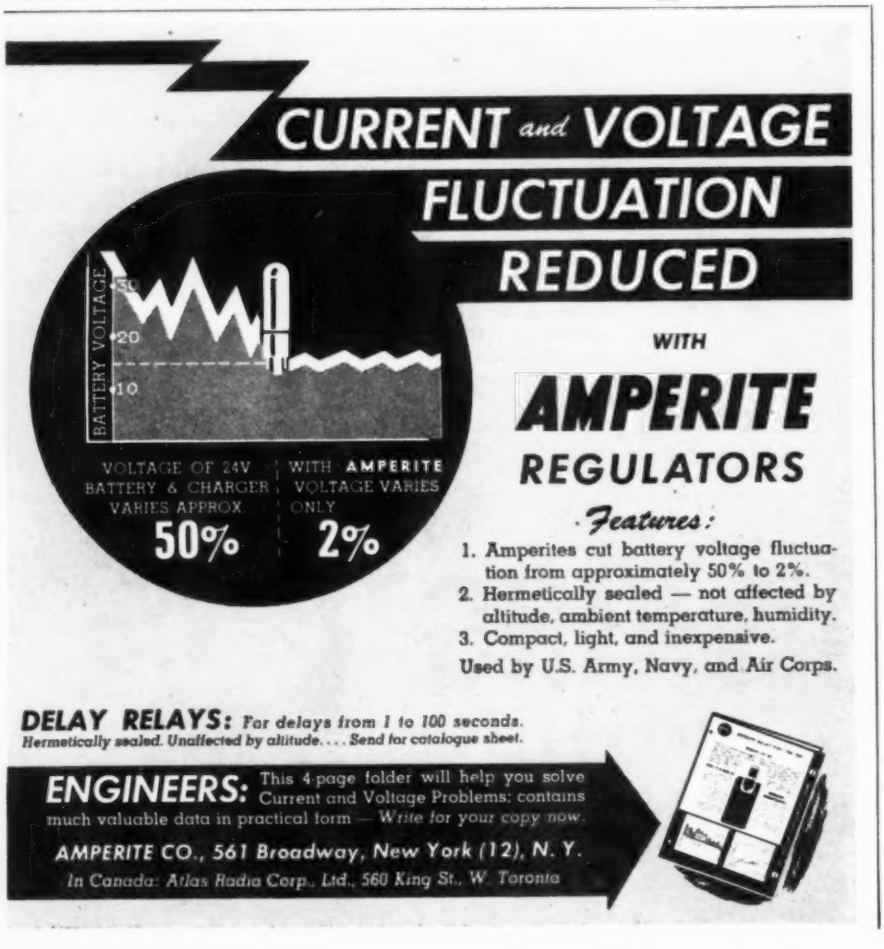
It affords the same privacy as all other mail after it has passed through censorship, the volume of it and the mechanical handling making it prohibitive for operating personnel to read it. Users of it, however, should be sure to make their writing large enough, as some V-Mail with tiny script reduced in reproduction has proved difficult for the recipients to read.

However, V-Mail has one inflexible limitation. It cannot accommodate enclosures. A photographed dollar bill would be hardly expendable, a photographed stamp hardly usable, or a photographed stick of gum hardly chewable, even if it were possible or legal to take V-Mail pictures of such objects.

As the V-Mail letters are opened mechanically and at such a high speed, extra contents are usually scattered and can't be traced back to the letters. Even pasted pictures in V-Mail letters cannot be transmitted because the recording machines are made to accommodate only a certain thickness of paper. When the enclosures can be traced back to their original letters, the letters are resealed and sent by regular mail.

In spite of difficulties, the acceptance of V-Mail is growing constantly both with our overseas forces and with the people at home. Volumes are growing larger each month. Plans are being made for new stations and for means of improving the service. A new station has been opened in Chicago to serve Midwestern States. By having the films flown directly to Chicago, a saving of 24 hours is being made in the delivery of V-Mail letters to people in that area.

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Waterproofing

(*Continued from page* 251)

waterproofing radio sets in vehicles is to prevent the equipment from being damaged by water action while the motor vehicle is being driven ashore from the landing craft. The waterproofing is either 100% effective or it is unsatisfactory; it must be done thoroughly to assure successful operation of the radio set while in the water or after reaching land.

The knowledge and experience gained in these waterproofing experiments should be most beneficial in the postwar period, as the same principles can be applied to the protection of many kinds of industrial apparatus.

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Survey Branch

(*Continued from page* 217)

4. That equipment has been issued according to the unit priority.

5. That the Training Status Report rendered by the Unit Commander (Army Service Forces units only) is correct and complete.

6. That personnel and equipment authorized is sufficient and of right type.

7. That all possible local action has been taken to correct deficiencies.

On "Final" surveys, the Survey Groups determine the following:

1. Status of personnel (officer and enlisted) complement in accordance with the Table of Organization.

2. Qualifications of the unit in procedures for securing replacements of personnel, equipment, and repair of equipment.

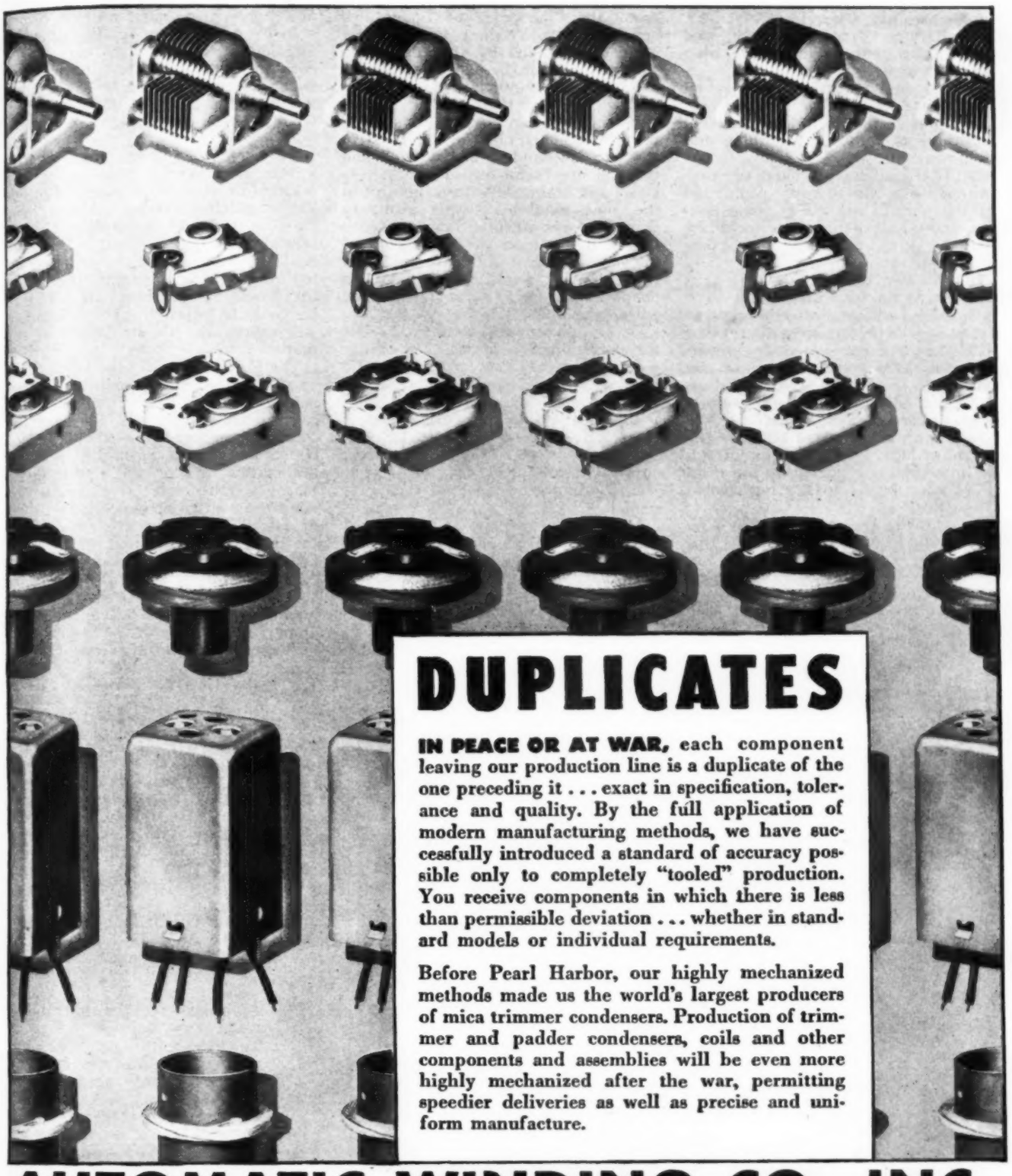
3. Qualifications of the individual specialists to perform their individual tasks. (This is *not* taken from records but is determined by actual check or performance tests either by individuals or groups).

4. Whether each team (radio, wire, message center, supply, photographic, etc.) can perform its combat mission and function as part of the integrated system. This is determined by actual tests of teams.

5. Whether the unit as a whole is capable of performing its tactical mission in combined operations. (This is determined, if practicable, by actual performance test in a field exercise, to include operation with air units, if appropriate.)

6. Whether the unit understands its function in the general plan and has in its possession appropriate Standard Operating Procedures, Standard Operating Instructions, etc.

7. Whether all personnel are qualified in weapons training; defense against gas (both personnel and equipment); first aid; and methods of self protection, including foxholes, concealment, active and passive defense against air and mechanized attack; etc.



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8. That minimum Army Service Forces training requirements (for Army Service Forces units only), and War Department policies have been complied with.

9. That administration of personnel is complete as to records, blood typing, immunization, dental and medical requirements, individual clothing and equipment, etc.

10. That unit has on hand (or that arrangements have been completed for the unit to receive at some definite point) all equipment, including spare parts, in accordance with existing authorization.

11. Whether the unit, if part of a Task Force, has or will have received its specific task prior to embarkation and is or will be proficient therein.

12. That personnel and equipment authorized are sufficient and of the right type.

13. That all possible local action is taken to correct deficiencies.

14. That deficiencies, beyond the control of local authorities to correct, are immediately reported by the most expeditious means to the responsible authorities.

Signal Corps Units are rated by Survey Groups as "Satisfactory" or "Unsatisfactory." A rating of "Unsatisfactory" is accompanied by a statement of the reasons for such a rating and a statement, in the case of a "Final" type survey, of the date by which it is expected that the unit can be made ready to perform its mission.

In rating a unit "Unsatisfactory" from the standpoint of unqualified specialists, the Signal Unit Survey Branch is guided by the realization that no unit can be expected to have 100 per cent of any class of specialists "skilled." It is therefore considered satisfactory when a minimum of 50 per cent of each class of specialist in the unit is found to be "skilled" and the rest are "semi-skilled" or "potentials" and trainable within the unit in the time available. This arbitrary yardstick was selected on the theory that if a minimum of 50 per cent of the specialists are skilled, the unit can function and the others, if semi-skilled or potential, can be further trained within the unit.

Other deficiencies, of course, affect the determination of whether or not a unit is satisfactory to perform its mission. The Signal Unit Survey Groups therefore check to insure that:

1. There is no misassignment of personnel.
2. There are no personnel with physical disqualifications.
3. There are no shortages of personnel.
4. Personnel is properly processed as to immunization, blood typing, dental requirements, service records, etc.
5. There are no shortages of equipment.
6. Weapons training is completed.
7. Minimum Army Service Forces training requirements are met (Army Service Forces units only).
8. Table of Organization or Table of Equipment do not require revision.

In determining the qualifications of individual specialists, the survey officers interview and test each man, using check lists. They are guided not by whether the man has learned what he has been taught but solely by whether he can do the work outlined in the job description for the Specification Serial Number of the position to which he is assigned in the Table of Organization. He is then rated as "skilled," "semi-skilled," "potential," or "unqualified." Determination is also made as to whether he has qualifications for some other Specification Serial Number. If his service could be better utilized in another job, appropriate recommendations are made.

The Survey Groups take all possible local action on the spot to correct deficiencies which they find. They also make recommendations to local authorities for correction of deficiencies which are the responsibility of local authorities to correct. Deficiencies which require corrective action beyond the control of the Survey Group or Local authorities are reported to the Branch Headquarters, Office of the Chief Signal Officer, Washington, D. C.

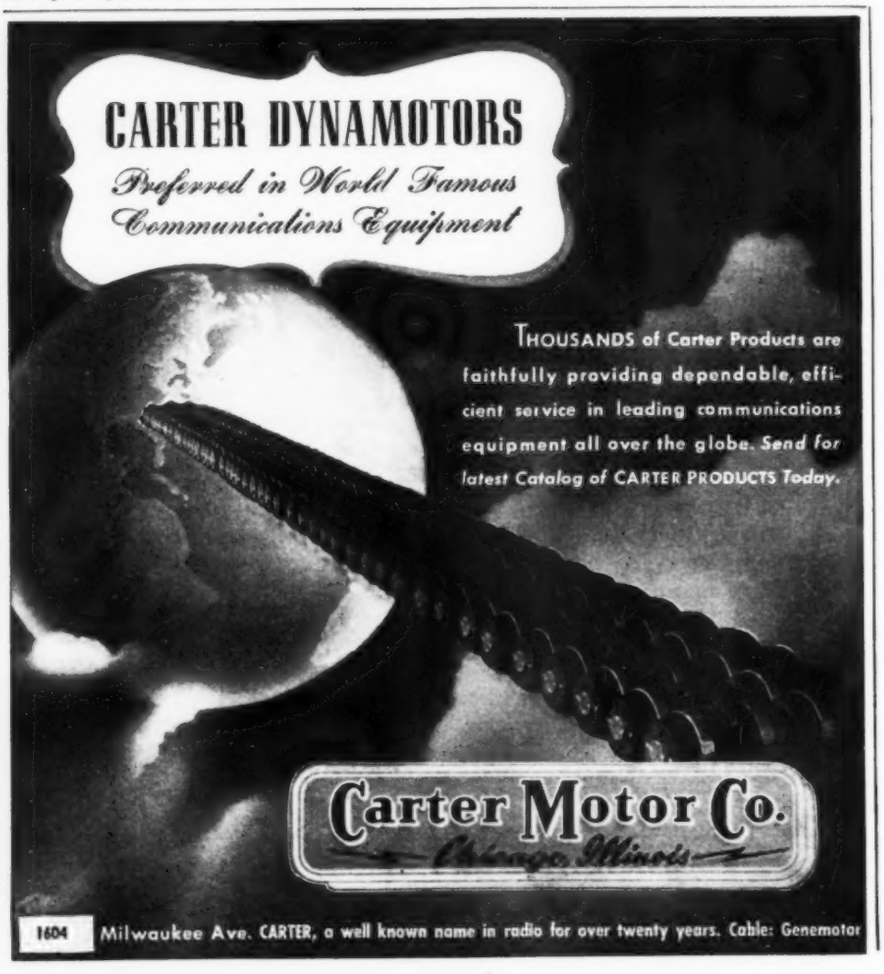
Immediately upon completion of its survey, the Survey Group prepares and forwards to the Branch Headquarters a Survey Report. This report is prepared in the following form:

Section I. General

1. Authority for making survey.
2. Type of survey (Initial, MTP, Final).
3. Superior Organization (assigned, attached, or originally a part of).
4. Authority responsible for training the unit.
5. Station and date of activation and reference to activation authority.
6. A concise statement as to whether unit is satisfactory or unsatisfactory:
   a. To initiate training in accordance with MTP-1 or a special training program designed for special units. (Initial type surveys.)
   b. In progress of team training. (MTP Type Surveys.)
   c. To accomplish its prescribed mission. (Final Type Surveys.)
   d. If unit is unsatisfactory, a concise statement will be made giving reason therefor.

Section II. Personnel

1. Authorized Table of Organization and date.
   Authorized strength, *(Officers), (Warrant Officers), (Enlisted Men).* Actual strength, *(Officers), (Warrant Officers), (Enlisted Men).*
2. Number of personnel by Specification Serial Number required to bring unit to authorized and allotted strength in accordance with authorized Table of Organization and activation order.

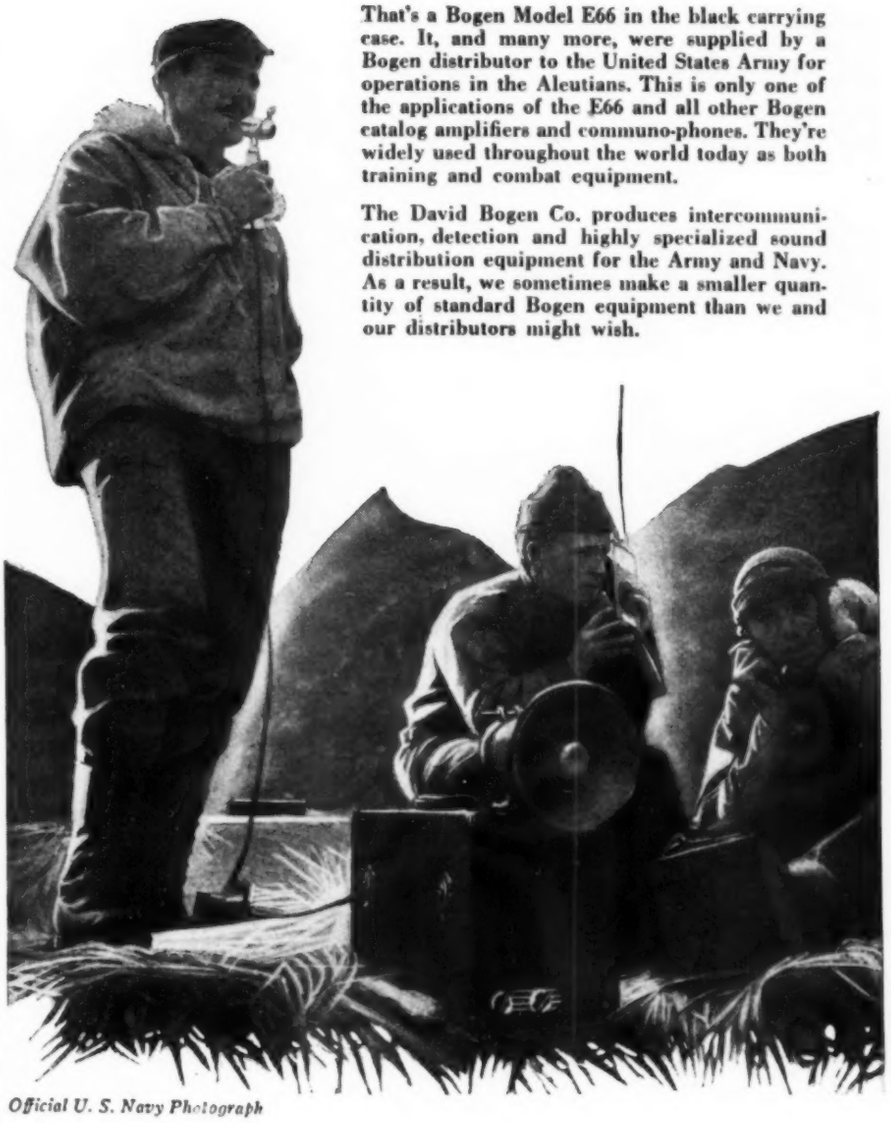


3. Names, grades, Army Serial Numbers, and Specification Serial Numbers of personnel over authorized strength, i.e.,
Personnel qualified in a specialty not authorized by Table of Organization.
Personnel overgrade.
Personnel overstrength in each Specification Serial Number.
4. Names, grades, Army Serial Numbers and Specification Serial Numbers of personnel misassigned, i.e.,
Personnel assigned to a specialty for which they are not qualified but are qualified in another specialty authorized by Table or Organization, (such cases may require reclassification).
5. Names, grades, Army Serial Numbers and Specification Serial Numbers of personnel not qualified according to Specification Serial Number and cannot be trained in unit in time allowable.
Indicate reason for disqualification.
Itemize subjects in which deficient.
Indicate where the unqualified specialists were trained.
Indicate number of personnel actually assigned the Specification Serial Number in each case.
6. Names, grades, Army Serial Numbers and Specification Serial Numbers of personnel not qualified according to Specification Serial Number and who can be trained in unit in time allowable.
Indicate reason for disqualification.
Itemize subjects in which deficient.
Indicate where specialist was trained.
Indicate degree of qualification either potential or semi-skilled.
Indicate number of personnel in the unit actually assigned the Specification Serial Number in each case.
7. List of deficiencies or discrepancies noted in personnel records.
8. Names, grades, Army Serial Numbers, and Specification Serial Numbers of personnel physically unqualified.
9. Other appropriate information, not covered above, relative to personnel deficiences.

Section III. Training

1. Give training program the unit it's training under.
Indicate progress of training in accordance therewith and adequacy thereof.
2. Status of training equipment, training aids, training manuals, training facilities, etc.
3. Status of individual training, i.e., Basic training.
Number that have fired rifle Course "C" and qualified.
Number that have not fired rifle Course "C."
Technical training and compliance With Army Service Forces requirements.
Requirements of "Preparation for Overseas Movement," etc.

This one is in the ALEUTIANS



Official U. S. Navy Photograph

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4. Status of team training, organization of teams, etc.
5. Status of organizational training.
6. Date of most recent Training Status Report submitted by the unit commander indicating all deficiencies found in this Report. (Army Service Forces Units.)
7. Other appropriate information, not covered above, relative to training deficiencies.

Section IV. Equipment

1. Number and date of Table of Equipment, Table of Basic Allowances, and special authorization under which equipment is supplied to the unit.
2. Priority for issue of controlled items of equipment. A statement as to whether this priority is sufficiently high for this unit to secure adequate training equipment or equipment for overseas shipment.
3. List of shortages of controlled items of Signal equipment.
   Show quantity authorized and on hand where full allowances have not been received.
   Include a statement as to the extent to which these shortages are retarding training of unit.
4. List of shortages of non-controlled items of Signal equipment.
   Indicate quantity authorized, on hand, and short where full allowance has not been received.
   Indicate the extent to which these shortages are retarding training of unit.
   Give the number and date of requisition and to which depot forwarded, and commitment date for its arrival.
5. List of shortages of equipment other than Signal.
   List separately controlled items and non-controlled items.
   Indicate the extent to which these shortages are retarding training progress.
   Give number and date of requisition and who placed same.
6. Number and date of most recent status of equipment report rendered by unit commander.
   Indicate deficiencies in shortages reported and those found by the Signal Unit Survey Group.
7. List deficiencies noted in supply records.
8. Availability of instruction literature furnished with equipment and adequacy of same.
9. Other appropriate information relative to equipment shortages and deficiencies.
10. General condition of equipment on hand, i.e.,
    Maintenance of equipment—Satisfactory or Unsatisfactory. If Unsatisfactory, state deficiencies.
    Methods of preventive maintenance.
    Any other information relative to condition of equipment.

Section V. Miscellaneous

1. Recommendations, clear and concise, presented so that there will be no question in the mind of reviewing and other interested agencies, as to what action should be accomplished and the reasons therefor of the following:
   a. Changes of Table of Organization, Table of Equipment, Table of Basic Allowances, etc.
   b. Modifications of equipment to more adequately fit it for the service intended.

When the Survey Report is received at the Branch Headquarters, it is analyzed and matters requiring corrective action are extracted and forwarded to the Branch, Service, or Division of the Office of the Chief Signal Officer or to such other Agencies, outside the Office of the Chief Signal Officer, as are responsible for taking the necessary corrective action. The Branch Headquarters follows up on these extracts to insure that proper corrective action is taken and secures reports of actions taken on all deficiencies before closing out each case. The function of the Signal Unit Survey Branch is to locate deficiencies and to see that deficiencies are reported to the agencies responsible, and to insure that *those* agencies take the necessary corrective action.

The Branch Headquarters prepares periodic reports for the Chief Signal Officer indicating surveys made for the period covered by the report, conditions of units surveyed, deficiencies found, and corrective action taken. By this means the Chief Signal Officer is informed of the general condition of all Signal Corps Units and also of serious deficiencies requiring corrective action.

Experience gained in surveying a large number of units over a period of seven months has clearly demonstrated the value of these surveys in preparing Signal Corps Units for performance of their mission. The advantages and accomplishments of the system may be summarized, briefly:

1. "Initial" type surveys enable units to start training quicker, and to complete the training in less time and with better final over-all efficiency.
2. "MTP" type surveys permit a check of the training programs, establish the date on which the unit will be ready to perform its mission, and allow more time for correction of deficiencies prior to movement of unit.
3. "Final" type surveys insure that no unit will be sent overseas in an unsatisfactory condition.
4. The cumulative effect of corrective actions has brought about improvement in many courses, programs, and methods in selection, classification, assignment of personnel, and in administration of units. This is evident by a lessening in the recurrence of deficiencies and by improvement in the qualification of specialists and the condition of units surveyed.

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The Radio Industry

(Continued from page 242)

recognized that it would be necessary to augment the production force by recruiting and training. The recruitment of new labor for radio industry plants presented no very great problem at the start. Many workers were available from less essential industries who saw an opportunity to help in the war effort by becoming workers in radio plants.

With so many manufacturers drawing from this source of manpower it very soon became depleted, and it was necessary for industry to recruit workers from new sources. One of the most plentiful sources of new workers was the woman power of the nation. For a long time the radio industry has been an employer of women in its plants and was, therefore, in a good position to recruit and absorb women workers. Prior to the war young girls and unmarried women were employed, now because of the tremendous needs of mass manpower it was found necessary to widen the field to include married women and others who ordinarily would not be found in the labor market.

There were two problems immediately apparent in the assimilation of these workers: the lack of any training at all on the part of the new workers, and the lack of adequate supervisory personnel available among the old workers. Since radio is, in itself, a rather highly technical field which requires semi-skilled and skilled workers for most of its operations, some sort of a program had to be provided to train this type of help. About this time, the Government started what was known as the "Training-in-Industry Program"; instructors were sent into the plants to provide training for employees who desired to become supervisors. Instructions in handling people, and in training methods for new workers, were given in a streamlined course to people on the job. As soon as these courses were completed, a large number of trainees were available for further instruction in order that they might be raised to the supervisory levels in the plant setup as hired production personnel. Careful training was given on the job to these employees which enabled them to perform the semi-skilled tasks necessary to maintain production.

This "Training-in-Industry Program" has been very successful and no doubt some modification of it will be continued into the peacetime period. The problem of supervisory manpower still remains one of the biggest bottlenecks in the production program. Manpower problems are in no sense of the word solved, for as soon as one set of troubles had been overcome another arises to take its place. Manpower has always been the No. 1 problem of production and there does not seem to be any single answer to its many ramifi-

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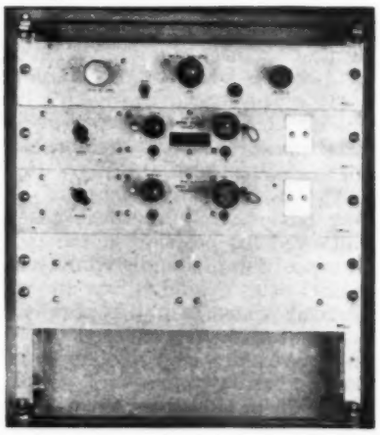
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cations. A further supply of labor will no doubt be available as the war program is curtailed and these workers can be absorbed into the radio and communications industries without trouble or delay.

Materials have been one of the crucial problems which the production managers have had to contend as most of the materials used in radio have been onthe critical list almost from the inception of the war. Such things as copper, aluminum, mica, and steel, to name only a few, have been at the top of the critical list. This has forced the industry to operate on a hand-to-mouth basis as far as critical materials are concerned for many months. Through the priorities system, established by the War Production Board, most of these materials were available to essential manufacturers on something approaching an orderly basis. However, the priority system introduced a complete new series of troubles of its own. First, about three times the supervisory and clerical personnel were necessary in order that the system could be efficiently established and administered. Second, due to the numerous changes in the system itself, manufacturers were continually at a loss to know how to proceed under these ever-changing rules and regulations. Third, production departments had to learn entirely new techniques on the purchasing, storing and inventoring of materials necessary for their war efforts. More recently under the C.M.P. the situation has become somewhat clarified and it is to be hoped that we are finally approaching a solution to one of the most troublesome problems of production.

One of the great stumbling blocks to the efficient operation of the production department was the dearth of machine tools. To further complicate this picture, considerable hoarding and overbuying of machine tools by manufacturers was evident. Here again the priority system operated to alleviate the condition which, to say the least, was no credit to the industry. Securing tool makers and better grade machinists remains a bottleneck for which there is no solution, since it requires considerable time and experience to properly train men in these trades.

With the exception of a very few of the larger plants, time and methods study as an aid to production, was practically unknown. Since the radio industry, like Topsy, had "just growed" and since most individual operations were of highly specialized character, each manufacturer had his own way of adjusting his labor and material to his own particular need. However, with the standardization of specifications and with the tremendous demand for material, time and methods studies were found to be necessary. Most of the plants in the industry have by this time instituted time and methods procedures which have greatly speeded up production with a consequent saving in cost and manpower. One of the greatest benefits to be gained will be the increased savings in the cost of operation in the all-important postwar period.

Productions engineering, which up to this time was something only vaguely understood in the industry, has emerged as a definite asset to the manufacturer. Efficient factory layouts together with labor saving machinery have contributed greatly to the efficiency of production.

Distribution

One of the largest parts of the operation of any radio manufacturer before the war consisted of his sales and distribution setup. Under the impact of the war there was no longer a necessity for a sales department, as such. Since most manufacturers converted 100 per cent to war, they had nothing to offer their ordinary channels of distributors. However, in the sales personnel of the various companies, the manufacturers had an invaluable asset, namely, specialized knowledge and experience. These men were immediately used as contact men between Government and industry. Here their knowledge and experience was of great service, both to the industry and to the war effort.

At about this time, the sales outlets of the manufacturers were beginning to wonder what their part would be in the war effort, since they knew when their present stocks of merchandise were exhausted in all probability no more would be forthcoming. They were most apprehensive concerning the future of their businesses. As it turned out, most of them had the ingenuity to become suppliers to the many war plants through the nation which they were peculiarly able to serve. Because of their strategic position, they were able to get orders from these plants carrying high priorities which in turn, enabled them to obtain merchandise from manufacturers. This has served to keep the better jobbers and distributors in business throughout the war period, and, in most cases, has enhanced his position in the industry. This position of the distributor will, no doubt, bear good fruit in the coming postwar period. Another service which distributors have rendered to the war effort was the continued provision of the necessary parts and supplies to maintain in operating condition the 60 million civilian radio sets in use in the country.

Associations

No story of the radio industry would be complete without mentioning the part that has been played by the various industry associations. They have continued to function as a liaison and clearing house between Government and industry and have drawn heavily from the resources of their membership, both in personnel and experience, to aid the Government in its efficient prosecution of the war.

Space is too limited to tell in complete detail the story of the part played by the radio industry in this war. Much of it can only be written after the din of battle has died away and men have had time to evaluate its service. This has rightly been called a radio war and the radio industry has responded nobly to every demand made upon it. There is one unescapable conclusion. By virtue of its background and service, the radio industry has assumed an obligation to itself and the future of America which it does not accept lightly and which, if the past is any guide, it will discharge honorably and fully.

In short, all associations in the industry, reflecting the thinking of their membership, have been of unestimable value to the war effort.

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Civilians in the S. C.

(*Continued from page* 238)

Corps decided to use under-engineers, or engineer aides, who could relieve the engineers of much of their technical detail work and enable them to devote themselves to wider fields. Engineer aides could be trained within a reasonable length of time. Courses were set up in several universities. The training consisted of six months' background and engineering education at one of the universities, and two months' supplemental laboratory training to prepare each student for specific duties.

At the height of the training program, the changing draft requirements began to catch up with many students. The Corps acted quickly to protect its investment in trainees. All who had become eligible for the draft, or were likely to become eligible soon, were dropped from training. The draft boards were notified of their availability and asked to assign them, upon induction to the Signal Corps so that the training they had already received could be utilized. That and the quick weeding out of unpromising material saved more than a million dollars in training costs for the government.

Since safety and health have been found to be chiefly matters of learning to be careful and taking care of one's self, those features are a part of the training program. United States Compensation Commission figures for 1943 reveal an accident frequency of 8.3 per million hours of work for Signal Corps civilian personnel as contrasted with a frequency of 13.2 for the War Department as a whole.

In all this recital of Signal Corps personnel accomplishments, it must be borne in mind that the Corps is simply carrying out the policies of its parent, the Army Service Forces, and its grandparent, the War Department. Most of the methods by which it accomplishes its mission are laid down by the higher authorities and many have been borrowed from the business, education and scientific worlds, but in the last analysis, whatever the Personnel Office has achieved, has been done by the thousands of men and women to whom the word "boss" means a pair of crossed semaphore flags superimposed on a torch.

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hypothetical objective territory. This will be done, of course, well in advance of the beginning of operations. In the interest of speed and economy, standard equipment is used. There isn't time to design and produce special gadgets for each job. Nevertheless, there are thousands of different components that go into establishing a telephone central office of the size found in many small communities in the United States. There are innumerable parts that make up a workable radio station. There are all kinds of parts and accessories required for teletypewriter service. And they must all be secured here in the States. The specifications lists for these fixed installations are long and accurate.

Now we come to the second step. Again this is taken as far in advance as possible but at best the procurement must be done with extreme dispatch. Usually it has to be done in a hurry. The Agency uses standard parts. These are the things that come off the assembly lines of the communications equipment factories and laboratories throughout the nation. These are the things that are stocked in the various Signal Corps Depots and warehouses in the States. But parts are moving out of Depots as fast as they come in. Will there be enough of everything specified by the engineers for each job? Have demands depleted stocks to such an extent that some equipment will be temporarily unprocurable? That is always the hazard to step No. 2—the procurement step.

Orders are sent out to the various depots where it is felt that specific equipment can be procured. Certain elements are drawn from Dayton; others come from Philadelphia. Some are requisitioned from Lexington, and so the procurement process goes.

The requisitions are accompanied by shipping instructions. They must be selected, crated, and shipped to make a transport or a cargo ship at a certain place before a certain time. That is what experts call "concentration." The important thing is that there can be no delays. There can be no missing parts. If there are—there will be a breakdown in the plans of operation.

To secure this concentration *on time* requires field trips to depots and to manufacturing plants. It sometimes involves assistance in securing priorities for manufacturers. It needs checks on transportation facilities—tracing motor caravans and freight cars. It involves switches to air express and the employment of special couriers. Everything, in fact, is done to make the ship on time.

Checks and rechecks are made in the Philadelphia headquarters and the progress of each installation is logged from hour to hour. When records show that every procurement step has been taken—when checks show that everything is on the way—the Agency does not leave the shipment of the component parts to chance. An officer from the Agency is on the docks to check arrivals, to supervise temporary storage, and to report shipments that are behind schedule. And, when the ship is being loaded, this officer stands by to see that everything is stored aboard.

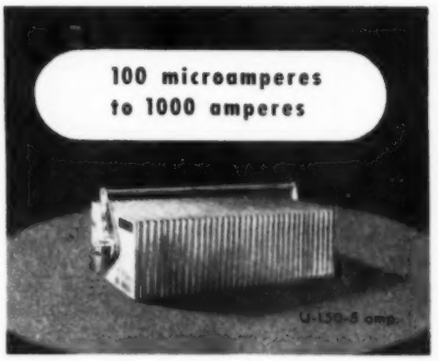
As soon as the transport reaches the docks abroad, in this territory we are using as an illustration, the Signal Corps equipment is unloaded and transported to the pre-determined location where it is to be installed. If it consists of telephone, teletypewriter, and radio equipment, it will be awaited by the requisite number of specialized troops to do the complete job in a hurry. These military organizations in the theaters of operation are composed of officer and enlisted personnel. They are known as Special Installation Signal Service Companies. In their ranks must be experts in every phase of electrical communications.

The formation of the Special Installation Signal Service Companies has presented a major problem to the Agency in that all of the officers and men require specialized training due to the highly technical features of military communication facilities. Many of these are secret. Many are new developments born of war necessity. The training has been and is being conducted in the training departments of some of the larger communication companies and manufacturers of communication equipment, as well as in the training establishments of the Signal Corps. The training is intensive. Fortunately there is a large percentage of electrical engineers and others with practical, peacetime training in the communication's field in the Signal Corps—men who take to the military aspects of communication like ducks take to water. This has helped the training program immensely. It has helped the Agency get into action much earlier than if it had to start with absolutely green men.

In this imaginative instance, involving a theoretical fixed installation the Agency has:

1. Engineered fixed telephone and radio installations for conquered territory.
2. Procured great amounts of equipment and seen to it that it made the ship and was delivered at destination.
3. Installed the equipment with its trained personnel in the theater.
4. Provided communications equipment, the maintenance of which will be the responsibility of Signal Corps troops for the duration and as long thereafter as is necessary.

While the above is a theoretical case, the Plant Engineering Agency is today doing numerous jobs like the one outlined. This, despite the fact that the Agency was only established



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on the 23rd of January, 1943. From that time on things moved with tremendous speed.

At its birth the Agency found a multitude of overseas and coastal jobs in its lap. Work had to proceed on these while plans for moving the Agency to Philadelphia progressed. Quarters, suitable to house a sizeable organization, had to be found by February 1. There was nothing available. Thanks to the generous offer of General Farmer, Commanding General of the Philadelphia Signal Corps Depot and Procurement District, the Agency was allotted temporary quarters in one of the Depot's branch warehouses.

The equipment started off from Washington consisted of hundreds of safes, files, desks, typewriters, chairs, and a miscellaneous assortment of drawing boards, tables, lockers, coat racks, and other office equipment. On Saturday morning, January 30, it started moving. All through Sunday, January 31, the moving continued. By Monday, February 1, the temporary office of the Agency in Philadelphia was shaping up. By Tuesday, February 2, it was functioning on the same basis as it was in Washington, three days before.

The move involved more than furniture and fixtures. The officers and most of the civilian personnel assigned to the Agency, when it was activated in Washington, had to be moved also.

This was a problem the visualization of which needs no elaboration to suggest its magnitude.

Rush jobs in progress—

Moving equipment and personnel 140 miles,

Practically overnight—

These in themselves were enough to keep nerves fraught to the raw edge.

But, simultaneously, there was the necessity of expanding the organization—not only at headquarters but also in many parts of the world. The job was an expansion program that had to be done on the doublequick—with no rests between marches.

While office furniture was being moved into temporary headquarters, people were being interviewed for jobs in the Agency.

Now it is no military secret that Army routine is a system unto itself. To an efficient civilian secretary, for instance, the "red tape" and paper work of the Army is an unknown quantity. New employees, regardless of their clerical and stenographic aptitude, must learn the way of the service.

So, while the Agency was working and moving and hiring, it also got into the business of starting a training school for new employees, a school which was maintained at full capacity for more than six months and is still operating, although on a decreased basis.

As remarked earlier, production plants and Signal Corps Depots in all parts of the country furnish Agency units with equipment. In Philadelphia, it is geographically far removed from the West Coast. Hundreds of miles separate it from the Southern Coast and from the northern reaches of New England. In order to embrace the whole world within its organization and so that it might have representation at all points of the compass, without undue expenditure of time and money in traveling, the globe was divided into four sectors with headquarters at strategic points. The Northeast Sector headquarters are located at Presque Isle, Maine, the Southeast at Miami, Florida, the Northwest at Seattle, Washington, and the Southwest at Honolulu, T. H. These sector offices are manned by capable officers and a staff of civilian personnel.

These instances are cited to illustrate the size of problems that have been faced and to demonstrate the speed with which the Agency has been operating. Time has been against it. Hard work has been the lot of its personnel but the results are beginning to show and the Agency officer and civilian personnel can well be proud of their efforts.

The Plant Engineering Agency is now housed in the Architects Building, Philadelphia, Pennsylvania.

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Organization

(*Continued from page* 91)

checks continuously training of Signal Corps units and individuals to assure that signal troops are ready for overseas duty.

Training

Communications in modern warfare, involving rapid movement and simultaneous land, sea, and air operation in all theaters of operation, necessitates the training of many different specialists to a high degree of technical skill to perform their many and varied missions.

Signal Corps troops are given thorough courses to qualify them as radio operators, radio repairmen, cable splicers, installers, line foremen, powermen, switchboard installers, wire chiefs, telegraph printer operators and repairmen, truck drivers, clerks, as well as many other specialties.

The training is carried on at four posts in the United States. Fort Monmouth, New Jersey, regarded as the parent station, contains an Enlisted Men's School, and Officer Training School, and the only Officer Candidate School for the Signal Corps in the country. The post is known as the Eastern Signal Corps Training Center.

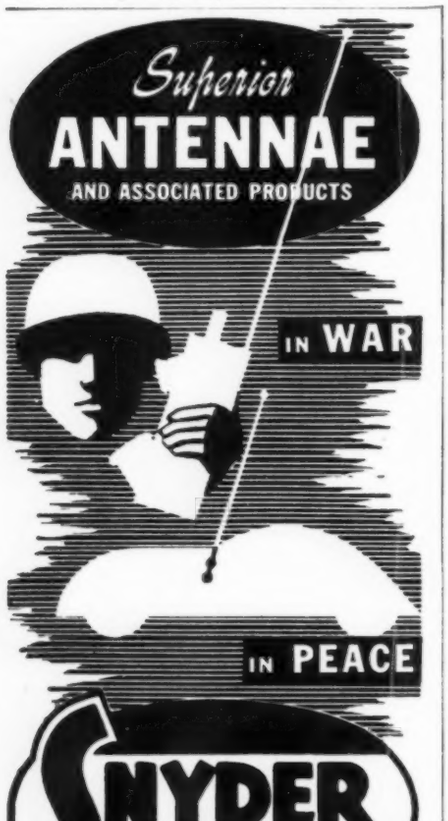
Camp Crowder, Missouri, named the Central Signal Corps Training Center, is the largest of the Signal Corps training stations. This center also contains a school. On the West Coast at Camp Kohler, near Sacramento, is located the Western Signal Corps Training Center and school.

For advanced electrical students the Signal Corps operates a school in Florida where large numbers of skilled young men are receiving training in the maintenance and operation of more complicated equipment.

There are other Signal Corps Schools at the Philadelphia Signal Depot and at various Signal Corps installations throughout the country, which provide specialized training for additional thousands of men. Telephone companies are teaching small groups of men and many of the large suppliers of communications equipment conduct classes in their plants where Signal Corps troops can learn how to operate, install, and maintain the equipment which they manufacture.

The Army Communications Service controls and directs the development, engineering, installation, operation, and maintenance of all fixed radio and wire communication and signal security facilities for the Army. Its operations are world-wide in scope.

This service controls and directs the operation of the War Department Sig-





nal Center, the War Department Code Center, and associated Transmitting and Receiving Stations in or near Washington. These functions combine to fabricate the War Department Administrative Communications Network, comprising Radio, Telephone, Telegraph, Wire and Radio Photo transmission, together with respectively related communications media.

This service supervises the Army Amateur Radio System; controls and directs the operation of the War Department radio net and associated facilities, and prepares engineering plans for military fixed communication requirements throughout the world.

One of its outstanding contributions during the past year was the over-all engineering on the Alaska Military Highway telephone line, running from Edmonton in Canada to Fairbanks in Alaska. The construction of this telephone line was characterized by Under Secretary of War Robert P. Patterson as "one of the great stories of Army accomplishment . . . a story of almost superhuman effort by the Signal Corps."

The Army Pictorial Service performs all photographic work for the Army Ground Forces and Army Service Forces. Its duties encompass supervision of the V-Mail and official Photo-Mail Services.

Heart and center of the Army Pictorial Service is the Signal Corps Photographic Center at Astoria, Long Island, New York. There are produced hundreds of training films which are distributed not only to the various branches of our own Army, but also to those of our allies. There also are trained motion picture and still camera photographers, who march into the very vortex of battle to get some of the excellent shots of actual combat scenes viewed almost daily on screens throughout the country.

One of the outstanding accomplishments of the Army Pictorial Service during the year was the opening of fourteen V-Mail stations for the expediting of soldier mail to and from points all over the globe. This service contributes to the morale of troops overseas and their friends and relatives at home, by eliminating the long delay of letters sent by less rapid means.

Office Service

The Office Service Division performs administrative and service functions for the Office of the Chief Signal Officer. The Division has three branches:

The Administrative Branch which receives and distributes mail; administers personnel relations, and provides counselling service.

The Service Branch, performing office service functions, including distribution of office supplies and furniture, and operating the Signal Corps Reference Library.

The Special Activities Branch gathers and distributes signal communication information to newspapers, magazines, radio, picture services, and other media through the War Department Bureau of Public Relations. It arranges ceremonies for Army-Navy "E" Awards to plants manufacturing Signal Corps equipment. It prepares the Annual Report for the Chief Signal Officer and the History of the Signal Corps.

Wars are not won by signal communications alone, but wars can and have been lost for lack of them. Signal communications of today represent the expenditures of billions of dollars, thousands of miles of wire, tons of equipment, skilled engineers and technicians in the thousands and specialists in the hundreds of thousands, world wide radio networks, telephones, teletypewriters, telegraph, automatic and intricate machines performing seemingly miracles.

This then is the job of the Signal Corps and the organization set up to accomplish this end. No organization can expect to exist in a fixed or static state, for without flexibility it will break. The pressure of modern war demands a capacity for adjustment and readjustment and concerted effort will continue to be exerted to attain organizational perfection.

Total victory is our goal and it is the determination of the Signal Corps to furnish our Army with communication service and equipment worthy of American brains and ingenuity.

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Military Training
(*Continued from page* 190)

rectly to a specialist course while a few will first take the Electrical Fundamentals Course. Assignments to specialty courses are based upon educational background, previous experiences, demonstrated ability and personal interest by the officer in that field of signal communication.

The Electrical Fundamentals Course is a seven-weeks' program to qualify those who have no previous background in electricity for courses in telephone, radio, or wire. Graduation from Company Officers' Common Subjects Course or Officer Candidate School is the prerequisite for entrance. This course continues basic military training and physical conditioning and covers the basic fundamentals of electrical theory and practice through direct and alternating current theory and circuits, vacuum tube operation and circuits, the fundamentals of electrical machinery, and internal combustion engines. Particular consideration is given to standard Signal Corps field equipment. All phases of the course are dealt with from the viewpoint of basic wire and radio communication, with emphasis on practical exercises in the laboratory and work with electrical wiring diagrams.

The Administration and Supply Course is of five weeks' duration. Experience in a merchandising field, warehousing and storage, purchasing

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with KATO KONVERTERS. Furnish standard 110-volt AC from 32, 110, or 220-volts DC. Good deliveries on sizes 350 through 1500 watts.

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But Worth Going After!

Illini-Hycap Victory Type Condensers are superb performers that literally have everything . . . long life, stamina, appearance. You'll agree when you try them. Present output necessarily limited because of war demands for regular types, but we're doing our best to make them available in greater quantities soon.

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or manufacturing of merchandise is preferred. This course covers administration and supply functions of Signal Corps field units, post camp, and station Signal Officer; Signal Property Offices and Signal Depots. There is also a continuation of basic military training and physical conditioning. Graduates of this specialty course may report to tactical units, to Camp Lee, Va., for a four weeks' course at the Quartermaster Depot, or to one of the three Signal Corps Supply Depots for a specialized four-week Depot Supply Course. Graduates of Camp Lee may also report to one of the three Signal Corps Supply Depots, at Philadelphia, Pa., Lexington, Ky., or Dayton, Ohio.

The mission of the Message Center Officers Course is to prepare selected Signal Corps officers to supervise the operation of Army message centers. These students are also given basic instruction in maintenance and operation of motor transport vehicles, and are given a thorough knowledge of the capabilities and limitations of the various means of signal communications.

The Advanced Officers Signal Supply Survey Course offers ten weeks of instruction for selected Supply Service Officer personnel in the grades of Lieutenant Colonel, Major and Captain. This training program is divided into three parts. The first part is military training, physical conditioning, individual protection, sanitation and weapons. The second and third parts of this course consist of classroom lectures on general Signal Supply Survey subjects and allied subjects, and conducted tours of Signal Supply installations and other Signal Corps activities.

The Advanced Officers Course, sixteen weeks in duration, is to instruct specially selected officers in subjects necessary to qualify them to: (1) command tactical Signal Corps battalions, (2) serve as Signal Officer of tactical units, (3) train Signal Officers for the Army Ground Forces and Army Air Forces, (4) plan and participate in Signal Corps responsibilities of Air-Amphibious operations. Students must have demonstrated fitness for higher command responsibilities with a field unit or have sufficient technical ability together with adequate field experience to qualify for higher command responsibilities. Students should be of the grade of captain or higher, or senior first lieutenants fitted for staff assignments with higher command. The course places emphasis on development of signal orders, wire and radio communications, amphibious operations and planning, tactics and tactical applications of signal communications for all armed forces.

The Officers Electronics Training Center located at Cambridge, Massachusetts, offers training at Pierce Hall and Cruft Laboratory, Harvard University, and at the Massachusetts Institute of Technology. Prerequisites for this training are a B.S. degree in Electrical Engineering, Electronics, or Physics, and completion of three months of basic military training.

The program of instruction at Pierce Hall is a review of mathematics, electricity and magnetism to officers who fail to pass qualifying examination for direct admittance to Harvard Cruft Laboratory Basic Electronics Course or the qualifying examination for the MIT School. This course is one month in duration and the graduates continue training for thirteen weeks at Cruft Laboratory. Graduates of Cruft Laboratory may go direct to Camp Murphy, Florida, or they may be assigned to the thirteen-week Course at MIT before reporting to Camp Murphy for a continuance of their training.

Students completing the four months' General Electric Radio Operation and Maintenance Course at Schenectady, N. Y., go direct to tactical assignments, replacement pools or certain selected students may report to Camp Murphy.

At Camp Murphy, Florida, courses are given that provide detailed knowledge of specific airborne or ground electronics equipment for Air Force Signal Corps and for Coast Artillery specialists. Prerequisites for entrance to this training are satisfactory completion of the MIT School or the General Electric Operation and Maintenance Radio School or completion of approximately one year of field experience in an Electronic Training Group outside continental United States.

The Signal Corps Photographic Center at Astoria, Long Island, N. Y., trains officer and enlisted personnel in the following specialties: motion picture cameramen, still picture photographers (news and commercial), photographic dark-room men, film editors and cutters, motion picture sound recorder, camera repairmen (still and motion picture), sound recording equipment maintenance men, motion picture projector repairmen and motion picture equipment maintenance men.

These courses vary in length from six to seventeen weeks. The still photographer and motion picture cameraman must have had experience in the photographic field in order to be eligible for this training. Commercial experience is preferable to amateur work and experience as a news photographer or news cameraman is the most desirable. The still photographer studies and uses various types of cameras. Motion picture cameramen study and use 16mm and 35mm cameras.

Upon completion of the cameraman course, those students with a background in electricity are sent to the sound recording course, and then assigned to production units as sound cameramen recorders or maintenance men.

The course for film editors and cutters is designed for students who have had experience in this field in civil life or who show special aptitude for this type of work. The training consists of instruction in the principles of construction of motion picture productions and news reels, and extensive practical application of these principles.

Camera repairmen and motion picture equipment maintenance men must have a high mechanical aptitude and preferably have had experience as a watch-maker, instrument repairman, or other allied craftsman. These men are taught the construction and repair procedures on all of the types of cameras used by the Signal Corps.

Photographic darkroom men receive training in all phases of laboratory procedure. In this training emphasis is placed on high and low temperature and tropical processing and field expedients.

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Axis Quartz Crystals

(*Continued from page* 203)

they struck at Pearl Harbor, Jap bombers were returning from Brazil loaded with this precious material to be used in the sets to work against our boys on Guadalcanal and in the Solomons.

The Japanese have showed little ingenuity in the preparation of holders for the crystals and although their idea of using crystals is excellent, the results were impaired because many of these crystals, which we captured in their early airborne and infantry sets, would not even oscillate or had been ruptured by too much pressure on the crystal itself, poor electrical contact, or unstable mounting. As a matter of fact, the Bliley so-called "book type" crystal holder was extensively copied by the Japanese sets built in 1939.

The Italians used crystals sparingly as did the Germans in resonator units employed in their ordinary army pack set. They did make improvement in that, to get a multi-channel operation, they employed two and three calibrating quartz resonators in each set but contained in the same tube.

They (the Italians) copied us in their commercial designs which were converted for military use of necessity. In other words, they converted some of their broadcast equipment into military use to handle the heavy traffic at the rear units. These employed wafer-type crystals which our own sets use. The Italians were also very helpful on their captured sets in that they always put in a calibration chart and glued it in the lid of the pack set or somewhere near the transmitter.

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Procurement

(*Continued from page* 93)

moved to the Signal Corps—machine tools. A Machine Tools Subsection was set up, and it unraveled that knot.

When a problem like that seems all nicely ironed out, along comes a question like batteries. The rules that are made for steady production of other equipment won't apply to batteries because batteries deteriorate in storage and in transit. Since the Signal Corps is charged with supplying batteries for the entire Army, that's a good-sized problem in itself.

As each situation is met, new ones crop up, sometimes from surprising sources. A helmet, for example, wouldn't seem to have anything to do with communications procurement. But the old type radio headset can't be worn under the new, bucket-type helmet, so a whole production system had to be stopped and changed over when the new helmet was adopted.

One of the greatest factors in facilitating the change-over and expansion of industry were the educational orders placed with manufacturers by the Signal Corps in 1939 and 1940, to acquaint them with the procurement procedures and the types of equipment the Army would employ if war came to America. It proved to be a foresighted action without which the procurement accomplishments of the past couple of years could never have been possible.

Some idea of the over-all magnitude of the Signal Corps job of obtaining communications and other types of electrical equipment and photographic equipment, as well, for almost the entire Army, can be gained from comparisons with World War I.

In this war, the number of prime contractors with contracts over $100,000 for communications equipment is more than 100 times as many as in World War I; total expenditures have been more than 16 times as great; the number of contracts outstanding is almost twice as great; the types of electronics sets in production are five times as many; and where radio equipment represented ten per cent of the Signal Corps procurements in World War I, in this war it represents ninety per cent. In the first World War, maximum production of the commonest type of field wire reached 80,000 miles of single conductor a month. Maximum production now is 150,000 miles a month.

The Signal Corps of World War I boasted of 2,010 portable radio sets, mounted in heavy wooden chests, which were lugged to advance positions. In World War II there are thousands of types of radio equipment for advance operational use, so far surpassing the performance of the old heavy, socalled portable sets, that comparison is comic.

For the first World War, 7,029 airborne radio telegraph sets were procured. Requirements for one month of aircraft radio, of one model, in this war far exceed that figure.

Only 527 ground radio sets of all kinds were used in the first World War, while in this war, one month's production, for one particular type of ground radio telephone equipment, passed the 6,000 mark.

Much of this procurement has been for Lend-Lease purposes. But the benefits of Lend-Lease have not been all in one direction. The trial of our equipment in actual combat before being used by our troops was of invaluable aid experimentally, and Lend-Lease went far toward readying American industry for its war-time job, even as it now helps to keep production lines running smoothly and constantly.

Our Allies have been of great technical assistance to us in the manufacture of secret scientific instruments, airborne radio equipment, interference units, dynamotors, and teletypewriters, and their training films have been useful to our troops.

A hurry call from the Air Force for dynamotors that were not immediately available resulted in a cabled request to the United Kingdom, and within 72 hours, one hundred of them had arrived by air and were speeding to their

more so

NOW than in

peacetime

CORWICO

In normal times CORWICO industrial wires are used by folks who know what they want when they want it, and our slogan,

"MADE BY ENGINEERS FOR ENGINEERS"

expresses a creed and an over-all policy. Today, with Aviation communication devices taking a large percentage of the CORWICO output, we are even more assured that CORWICO wires have the right stuff in them. The meaning of our slogan seems to be intensified!

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Radio Engineer

For Important War and Postwar Work

Well established company located in Kansas City, Missouri, has fine opportunity for Radio Engineer with ability to design circuits for piezo-electric crystals. Must have knowledge of crystal industry, constructive imagination, and drive. Firm anticipates rapid post-war expansion. In reply give full details of education, experience, and date available. Also indication of salary expected. Application held in strict confidence.

Crystal Products Co.
1519 McGee St.
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WANTED
for the
PHILCO ENGINEERING STAFF

- **RADIO—ELECTRONICS—ELECTRICAL ENGINEERS**
  Men with degrees in electrical engineering or comparable experience in radio and television.
- **MECHANICAL ENGINEERS**
  Men with college degrees or comparable experience in the engineering aspects of electrical appliances, and in designing small machinery.
- **DESIGN ENGINEERS — DRAFTSMEN**
  Men with experience in mechanical designing, especially of small metal parts and of the automatic machinery to mass-produce them.
- **PRODUCTION ENGINEERS**
  Including electrical and mechanical engineers familiar with any phase of radio, radio-phonograph and television production.
- **PHYSICISTS**
  Must have science degree in physics. Some practical experience in radio is desirable.

WE expect the men who qualify for these positions to become permanent members of our staff and take an important part in our post-war program.

To maintain the Philco tradition of progressive research and development, is first and foremost in our minds. We provide the finest of technical equipment. But often, even more helpful is the inspiration and personal assistance of working with men who have done so much for the advancement of Radio, Television, Refrigeration and Air-Conditioning.

WRITE US TODAY

Qualified men not now engaged in work requiring their full talents, are invited to write us in detail as to their experience, education, family and draft status, and salary. Letters will be treated in strict confidence.

Hiring subject to local W. M. C. rulings.

WRITE TO MR. GEORGE DALE

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Several high calibre electronic engineers wanted with proven technical ability and well-balanced background in acoustics, broadcasting, frequency modulation, ultra high frequencies, special device circuits. Opportunities exist in designing, development and manufacturing of cathode ray, transmitting and general-purpose tubes; communications, electronic and precision test equipment.

Fast-growing company now in war production. Has world-wide background in electronic research and development; sound postwar future. In replying, give age, draft status, technical education, training and experience; salary requirements, availability. Enclose photograph. Address President, North American Philips Company, Inc., Dobbs Ferry, N. Y.

If working in essential industry at highest skill, please do not apply.

WANTED
LABORATORY INSTRUCTORS

- **Group 1:** Must be familiar with elementary DC & AC electrical measurements including application of Ohm's Law, wire tables, etc.
- **Group 2:** Must be familiar with advanced AC electrical theory including resonant circuits and electron tubes and associated circuits.
- **Group 3:** Must be familiar with tubes and associated circuits, must also be thoroughly familiar with modern receivers, with practical experience in trouble-shooting.
- **Group 4:** Must be familiar with electrical and tube theory and also with phone transmitters including practical adjustments, circuit tracing and trouble-shooting.

Pleasant, interesting work in suburban area of Nation's Capital. Ample living accommodations available for self and family. Excellent salary commensurate with education and experience. Secure positions with opportunity for advancement and increase in salary. All inquiries confidential. Please write, giving complete details to:

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For Point-to-Point International Radiocommunications Stations in the United States and abroad.

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Apply weekdays except Saturdays, between 10 A.M. and 3 P.M., personnel dept., or write

R. C. A.
Communications, Inc.
66 Broad St., N. Y. C.

"This section is designed to help the radio industry obtain trained, experienced, technical men to facilitate vital war production. Before applying for any of these positions consult your local United States Employment Service office to determine War Manpower Commission regulations concerning the changing of jobs. If you are already employed in war work at your highest skill, stick to your present job."

ATTENTION—Engineers and Technicians!

Airadio, Incorporated, is one of the most progressive organizations in the radio communication field, with modern plants and equipment, located in a city of homes, churches and schools, protected by modern fire, health and police departments, and having the recreational facilities found in a progressive city.

Presently engaged 100% in the production of equipment for the use of our Military and Naval forces, Airadio has definite plans for the post-war period.

To meet present and future needs for the design, development and manufacture of vital equipment requires the addition of trained engineers and technical personnel with experience in the radio communications field.

Applications are desired from qualified engineers and technical personnel interested in positions with war and post-war opportunities.

Please send all applications, giving full details of qualifications, to Airadio Incorporated, 2 Selleck Street, Stamford, Connecticut.

Statement of Availability required

Radio Engineers Wanted

Graduate engineers with laboratory experience needed for research and development work. Permanent employment with progressive corporation located in small city in central Pennsylvania. Write for application form. Persons now employed at essential activities at their highest skill cannot be considered without a statement of availability.

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ELECTRONIC ENGINEERS,

Mechanical Engineers
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Presently devoting 100% of its efforts to National Defense

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With experience and knowledge in the designing of Electrical Test Equipment for Electronics, required by large, established manufacturer of Electrical Indicating Instruments, now manufacturing for Armed Services, with complete plans for post-war. Permanent position with excellent future opportunity. State detail experience, education, age, salary desired. Our employees know of this advertisement. **DeJur-Amsco Corp., 99 Hudson St., N.Y.C.**

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Leading national merchandising organization has opening in laboratory for electronics engineer who is keenly interested in new application of electronic tubes in merchandising field. Replies confidential. Box 330 % R. N.

-ENGINEERS-

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National Union Radio Corporation, long acknowledged as a national leader in vacuum tube manufacture, is building a greater research and engineering staff. Our contribution to the war effort has been substantial; our plan for the future knows no bounds. If you get into this electronic tube picture now, you have a brilliant future, unlimited horizons ahead.

Our laboratories are in Newark, New Jersey.

We prefer men with a degree in electrical engineering, physics or mathematics and a knowledge of vacuum tubes; however, if your experience warrants, a degree is not absolutely essential. You must be draft exempt and not now employed full time at highest skill in a war industry.

CAN YOU QUALIFY AS:

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Write at once and tell us your experience, education, draft status, salary requirements.

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Fast growing organization in the Electronics field with two modern production plants; well-equipped, 30,000 sq. ft., Research Laboratory. Engaged 100% in war work. Excellent opportunity in the post-war field of Industrial Electronics, High Power Vacuum Tubes, Photo-Cells, Special Tubes, also Commercial Radio Equipment.

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If you are not now utilizing your highest skill for the war effort and are desirous of becoming associated with a busy but congenial organization whose long-range plans for the future offer solid engineering opportunities to really capable men, then investigate these three unusual openings with SYLVANIA ELECTRIC PRODUCTS INC.

ELECTRONIC ENGINEER—To work on the design and development of electronic devices. Prefer man with about five years radio engineering experience. Must have good grounding in U.H.F. Should be either an electrical engineer or physics graduate.

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In addition to the above positions we have a few other openings for engineers and physicists, who are interested in the design, development and production of radio tubes and electronic devices and equipment. If you would like to participate in developments that will later play a vital part in raising the American Standard of Living, won't you send us enough information about your technical education, training and experience and salary requirements to warrant an early interview in our New York, Boston, or Salem offices.

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Industrial Relations Department
254 Essex Street, Salem, Massachusetts

ENGINEERS WANTED

Radio and mechanical engineers wanted for war and post-war design work in the fields of:

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COMMUNICATION RADIO
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A degree in engineering or physics or actual design experience in these fields is required.

Positions are permanent for successful applicants. Write, giving full data on education, experience and salary desired.

ARMY (E) NAVY

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Continued

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We are seeking the services of one or two trained engineers who have had ample experience in Transmitting Tube Engineering. The men selected will not only be concerned with current war production, but should eventually fill good positions in postwar operation.

Also, we are looking for a few young engineers with good schooling and background to be trained for Transmitting Tube development and production.

This is an excellent opportunity for men who qualify to connect with a progressive, highly regarded manufacturer of Transmitting Tubes. Many special benefits will be enjoyed in your assocation with this company.

Please reply in writing, giving complete details, past experience, etc. Interviews will be promptly arranged. Persons in war work or essential activity not considered without statement of availability. Address, Chief Engineer, United Electronics Company, 42 Spring Street, Newark (2), New Jersey.

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Quartz Oscillators
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Equipment of all kinds
Hi-Speed Soldering Machines
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To Prime Contractors: We are well equipped to design and manufacture in quantities precision mechanical devices, transformers, condensers. Your inquiries appreciated.

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We desire men experienced in design and construction of facsimile equipment for 100% war work with world-wide communications company.

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ACIDPROOF CEMENTS—COMPOUNDS
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Technical cements for all purposes.
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destination across the entire country.

Most of the procurement personnel is civilian and the employee spirit of the Signal Corps has figured largely in the job already done.

Foundation of all the technical progress the Procurement Division has made, are the engineers, whose vision and ingenuity have worked miracles in conceiving and producing the communications equipment our fighting forces use today.

A decade, more or less, from now, when you telephone your office from your automobile, when you look at any portion of your plant or its branches instantly reflected in action on a screen before your desk, when you participate in a nation-wide conference without leaving your office, you may look back to the struggles of the Signal Corps with wartime production to trace the development of conveniences you will take for granted.

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Distribution

(*Continued from page* 95)

will be duplication of effort, waste, and inevitably delay. The Stock Control Branch is responsible for the necessary action to straighten out situations of this kind.

In the anxiety of getting equipment to the fighting forces and the combat zones, care must be exercised not to overlook the requirements of troops in training who will themselves be the fighting forces of tomorrow. Equipment would be of little use if delivered only to the fighting front to be used by men who had had no chance to learn how to operate it.

The issue of Signal Corps stocks is carefully controlled to insure that every one gets his fair share. Stock levels in all Signal Corps depots are continually being reviewed for the purpose of stocking each depot in accordance with the demands that may be placed upon it. Expensive, wasteful "cross-hauls" of freight are eliminated by having adequate stocks in the immediate vicinity of the spot where demands arise.

Besides the immediate problem of distributing assembled stocks, it is also the responsibility of Stock Control to work with other agencies in forecasting future requirements. Unless plans are made for procuring sufficent stocks of Signal Corps equipment now, the requirements of tomorrow cannot be supplied and the stock levels of the future cannot be maintained.

Just as important as the securing of new material for future demands, is the problem of disposing of excess and obsolete material. In any operation as vast as our war effort, there is bound to be some waste. Unless it is continually sought out and eliminated, this waste can assume large proportions and clog the channels of normal distribution. While this is the duty of every individual in the entire distribu-

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CORRESPONDENCE COURSES

RADIO Communications courses qualifying for all Federal licenses. Home study and resident courses. American Radio Institute, 44 East 23rd St., New York, N. Y.

USED Correspondence Courses and Educational Books sold or rented. Inexpensive. Money-back guarantee. Write for Free Catalog listing 4000 bargains.—(Courses Bought.)—Lee Mountain, Pisgah, Ala.

CORRESPONDENCE Courses and self-instruction books, slightly used. Sold. Rented. Exchanged. All subjects. Satisfaction guaranteed. Cash paid for used courses. Complete details and 84-page illustrated bargain catalog free. Write Nelson Company, 237, Chicago.

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RADIO interference causes. What they are, where they come from and how to prevent them explained in new copyrighted booklet, Radio Listeners' Guide. Written in plain language by interference expert, fifteen years in the field. $1.00 Postpaid. A. E. Rowe & Co., Inc., Dept. R, 660 Mission St., San Francisco 5, Calif.

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INVENTORS—Before disclosing your invention to any one send for Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions. Sent free. Lancaster, Allwine & Rommel, 414 Bowen Building, Washington, D. C.

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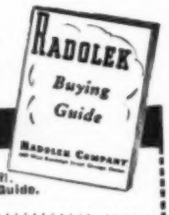
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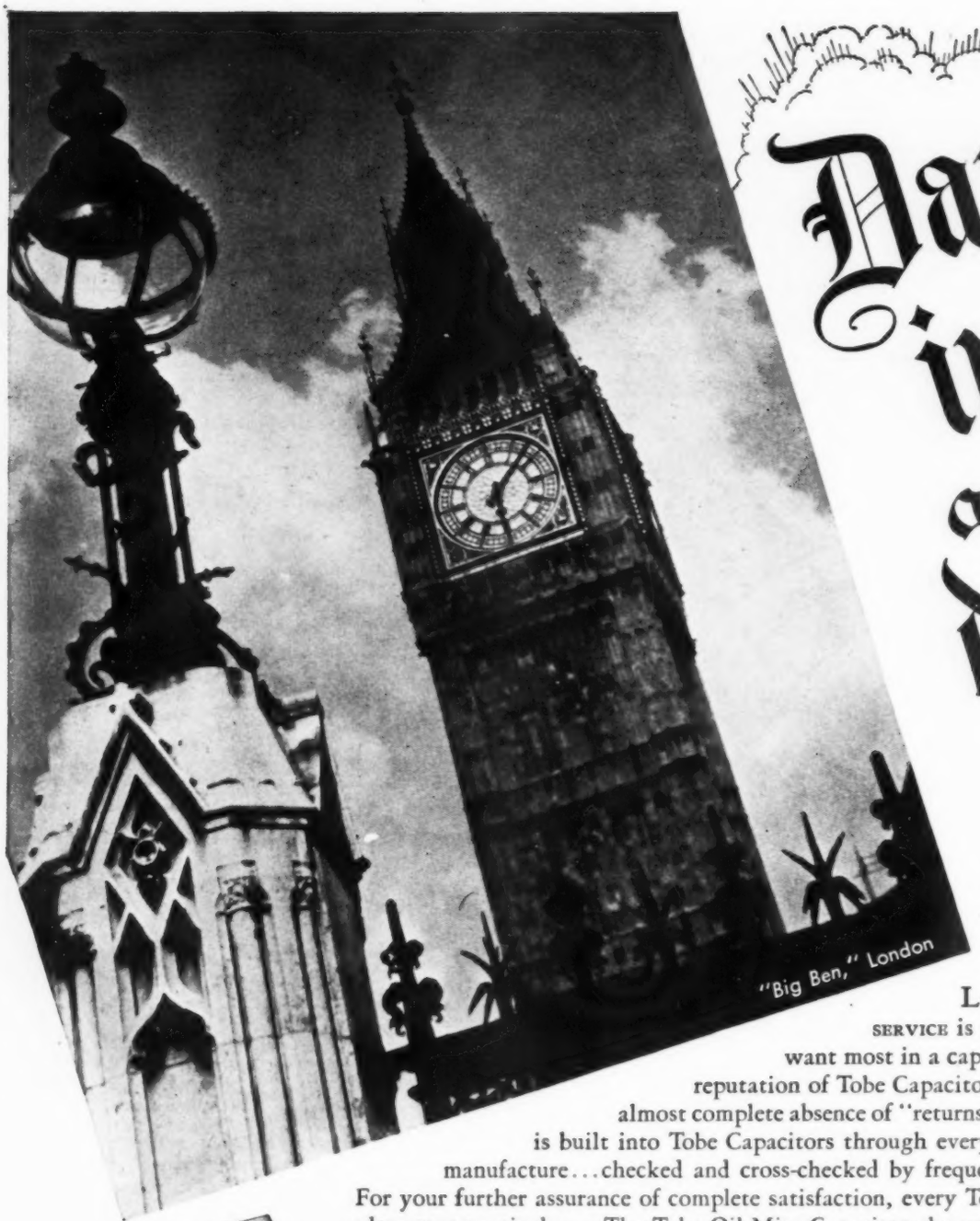
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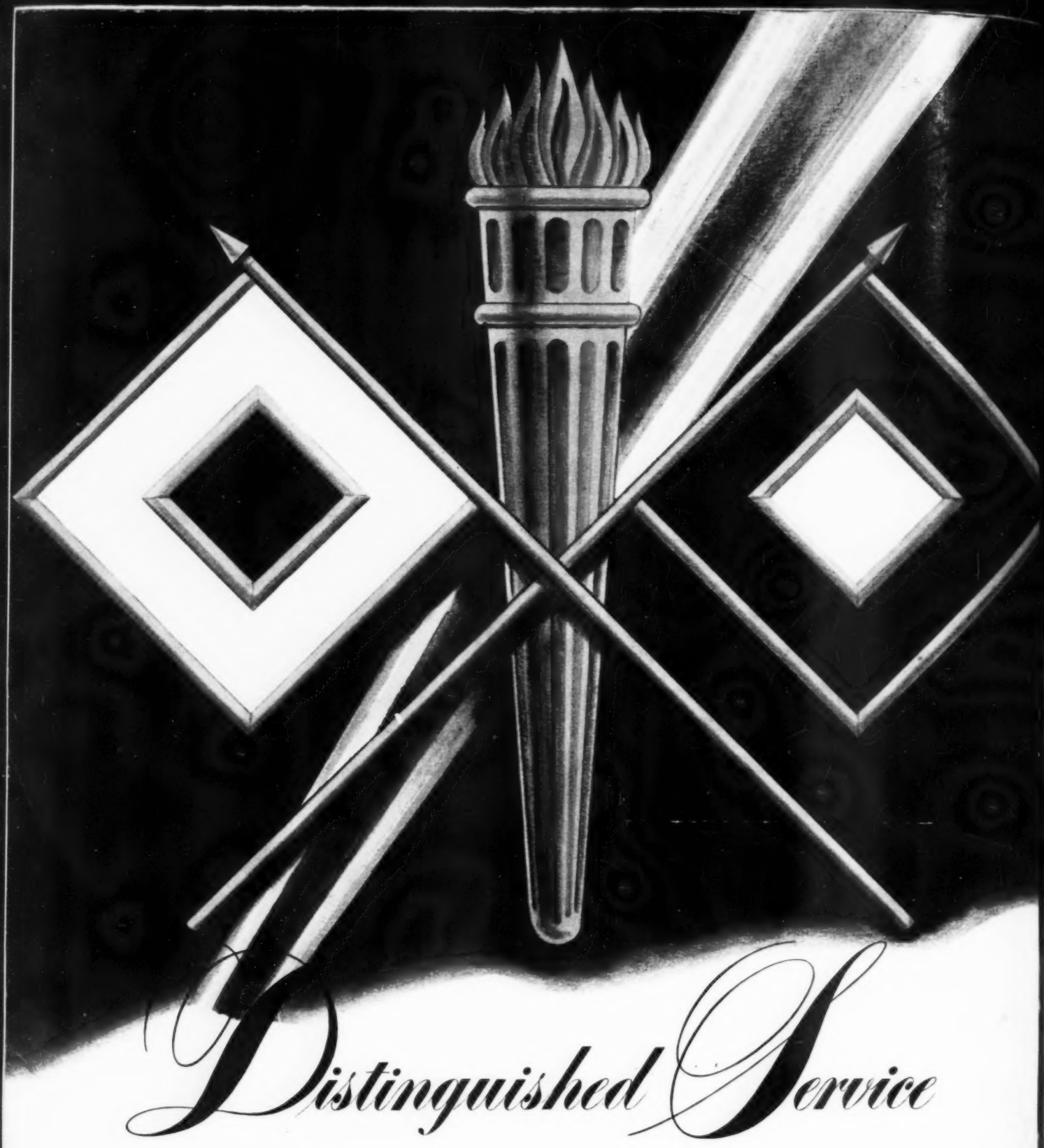


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